THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXXXIII. No. 2096.] LONDON, JULY 14, 1903. [55TH YEAR. PRICE 6d.

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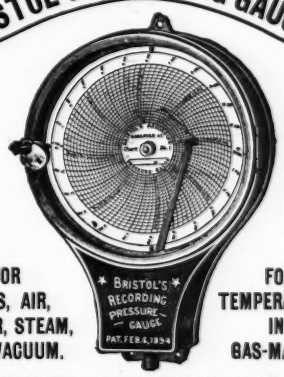

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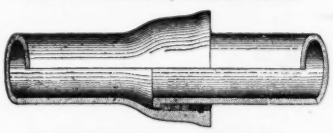

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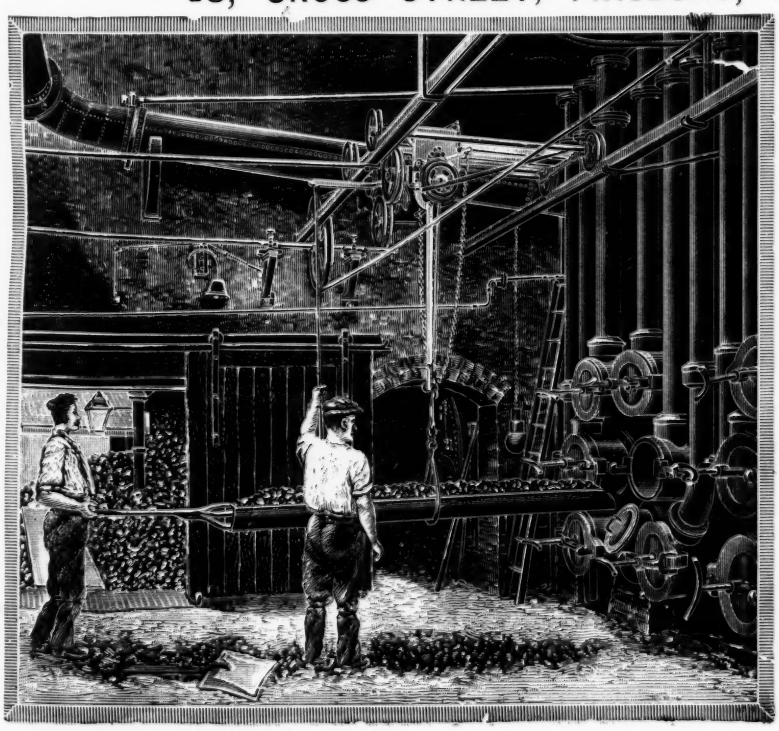

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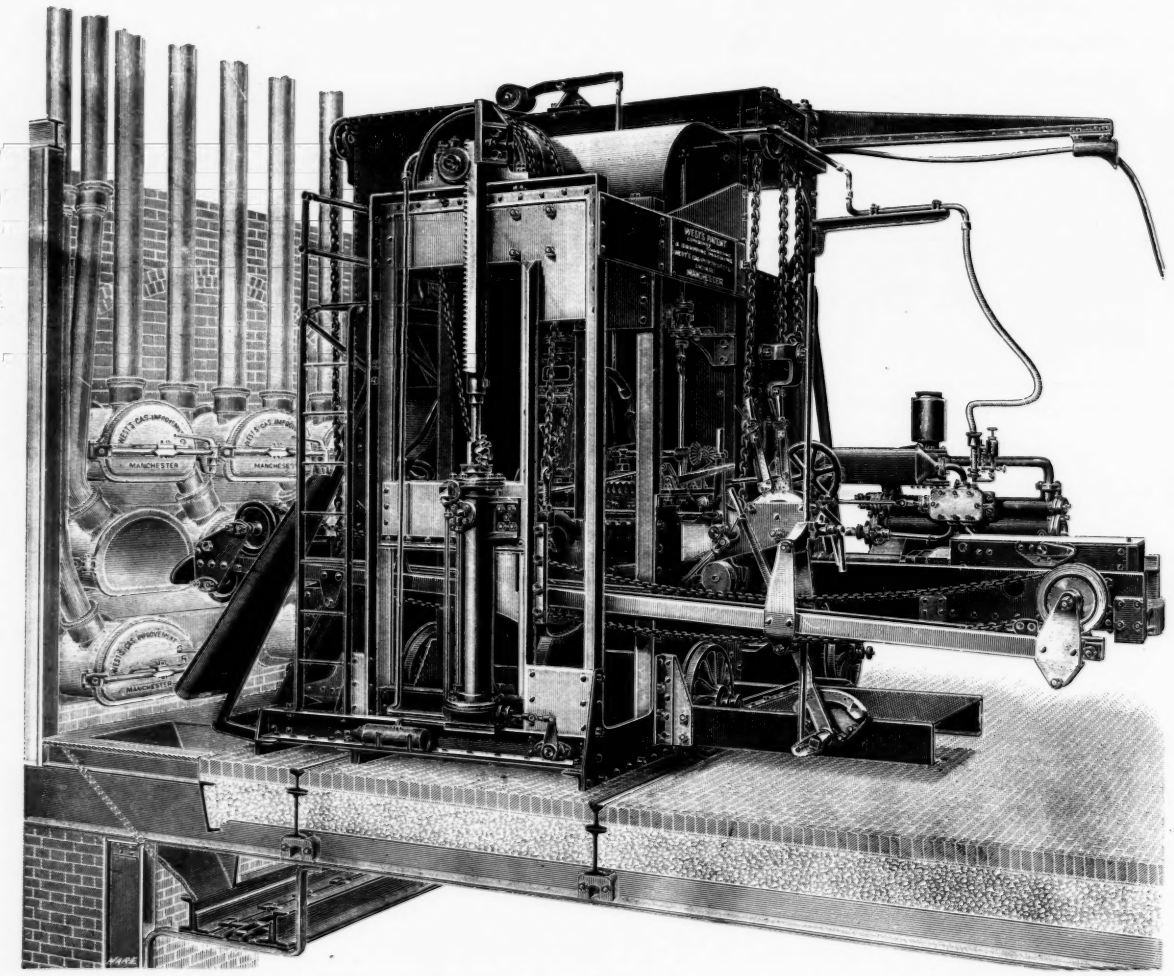

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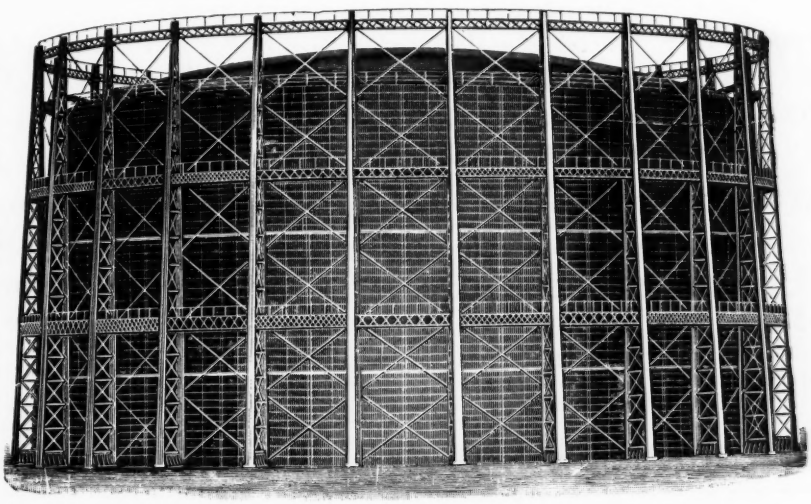

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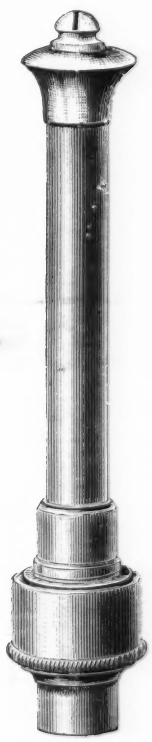

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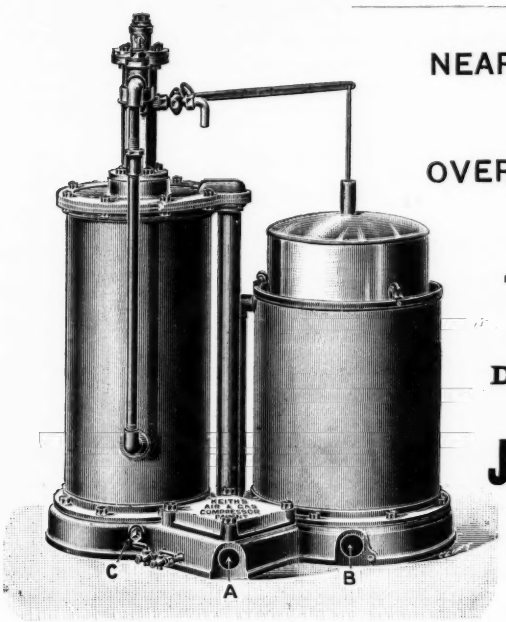

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OVER **6,000,000**—CANDLE POWER.

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The "**DURA**" Mantle is now made of the best 3-ply **Ramie** of English Manufacture.

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RETORT OVENS WITH INCLINED RETORTS (COZE SYSTEM)

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Altona	22	198	Kiel	16	144
Aalborg	6	54	Ludwigshafen	16	144
Barcelona	14	126	Lübeck	4	36
Basel	11	99	Lynn (U.S.A.)	5	45
Berlin II.	14	126	Malaga	6	54
Berlin III.	15	135	Malmoe	12	108
Berlin IV.	24	216	Mariendorf, Berlin, I. C. G. A.	32	288
Berlin V. (Schmargendorf)	20	180	Mannheim	6	54
Berlin, I. C. G. A.	46	414	Mainz (Maintz)	7	63
Bielefeld	8	72	Muelhausen i. Els.	10	90
Bockenheim, near Frankfort	29	261	Muehlhausen i. Th.	4	36
Bremen	30	270	Mailand (Milan)	24	216
Brooklyn (U.S.A.)	5	45	München-Gladbach (Munich)	8	72
Brüssel (Brussels)	8	72	Pest (Pesth)	15	145
Cassel	17	153	Pest Mineralölfabrik	1	3
Central Union Gaslight Co., New York	6	54	Posen	6	54
Charlottenburg	32	288	Plauen i. Voigtl	6	54
Chemnitz	27	243	Odense	9	72
Coblenz	13	117	Randers	4	36
Darmstadt	12	108	Remscheid	3	27
Danzig	20	180	Rostock	6	54
Dresden II.	14	126	Rixdorf	12	108
Dresden III.	10	90	Stettin	21	189
Drontheim	2	18	Stockholm	24	216
Düsseldorf	8	72	Strandvej	4	36
Esslingen	3	27	Trieste	18	162
Elberfeld	5	45	Winterthur	8	72
Frederiksberg	27	233	Witten	4	36
Flensburg	6	54	Wittkowitz	4	31
Gera	9	81	Wien (Vienna)	186	1674
Genf	7	63	Zürich	32	288
Göttingen	10	90	Berlin-Tegel	40	360
E. & J. Gutmann, Wien	2	6	Nürnberg	32	288
Haag (The Hague)	9	81	Plymouth	8	72
Haarlem	12	108	St. Gallen	6	54
Hamburg, Billwärder	24	216	Enschede	8	72
Heilbronn	10	90	Total	1144	10,263

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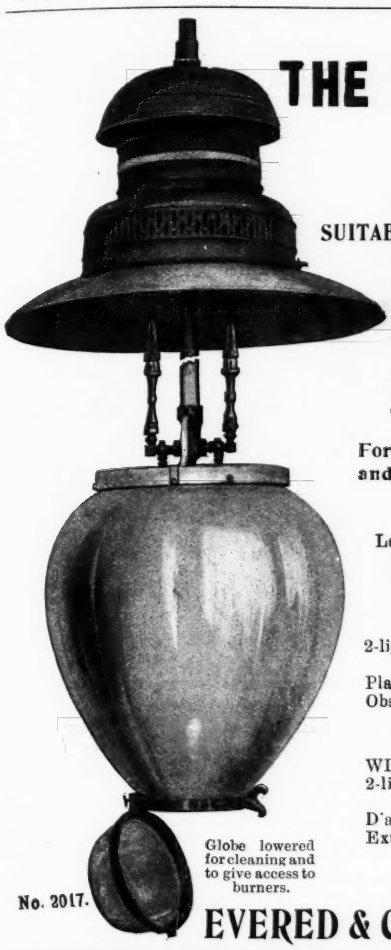

Globe lowered for cleaning and to give access to burners.

No. 2017.

This Lamp is artistically enamelled in fawn colour, and relieved with gold and white lines. It is made with a new method of lowering the globe, which gives easy access to the burners, and is fitted at bottom with a glass bowl and hinged and self-locking ring. It is also fitted with taps to turn off the gas, if required, and is suitable for the ordinary "C" pattern (with or without bye-pass, and lever and chains) or "Kern" Burners.

For designs of Wrought-Iron Brackets and Suspensions suitable for these Lamps, see separate list.

Length over all—2 or 3 light .. 30 in.
Globes .. .. 15 in. diameter.
Reflector .. .. 20 in. „

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2-light .. 52s. 6d. 3-light .. 58s. 6d.

EXTRA GLOBES. EACH.

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Burners extra.

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2-light .. 63s. 3-light .. 69s.

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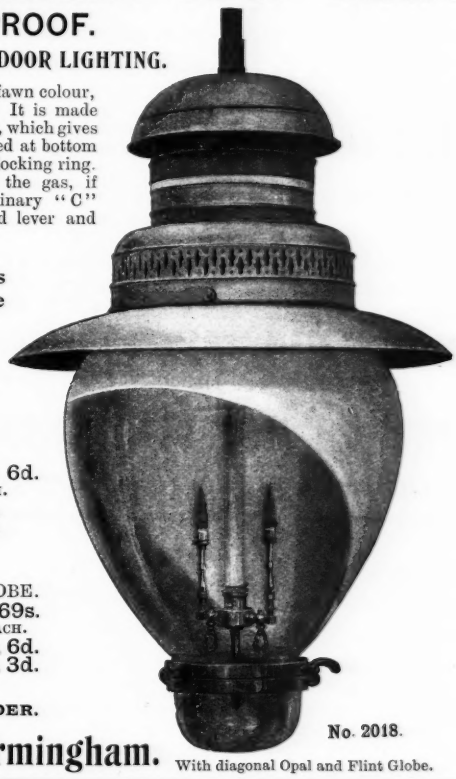

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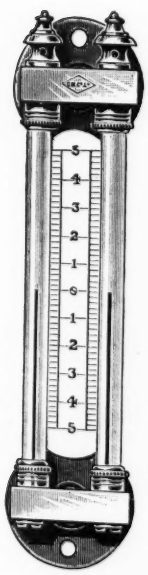

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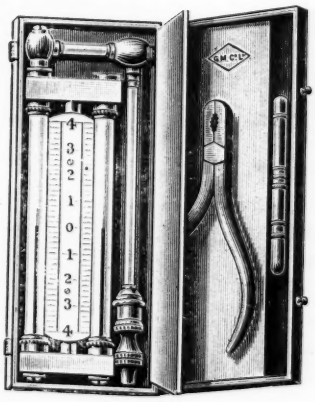
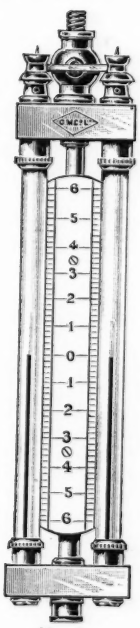


Inspector's Pocket Gauge.



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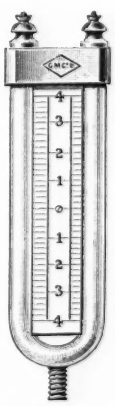

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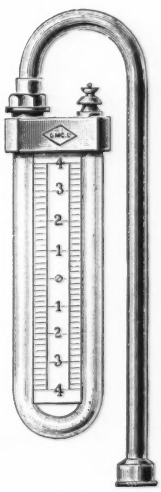

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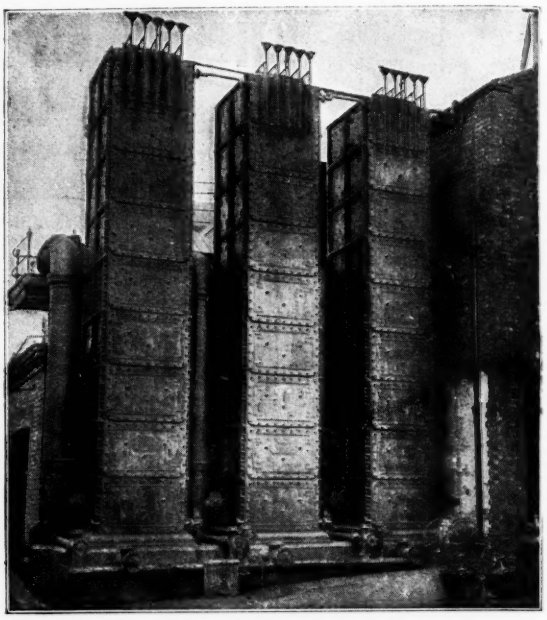

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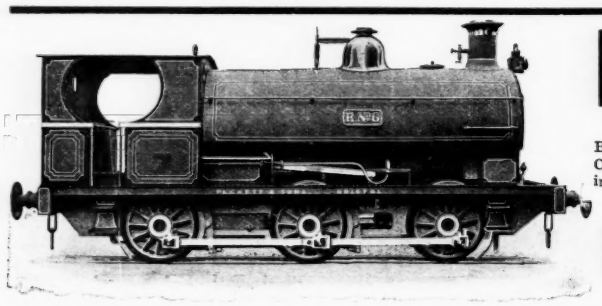

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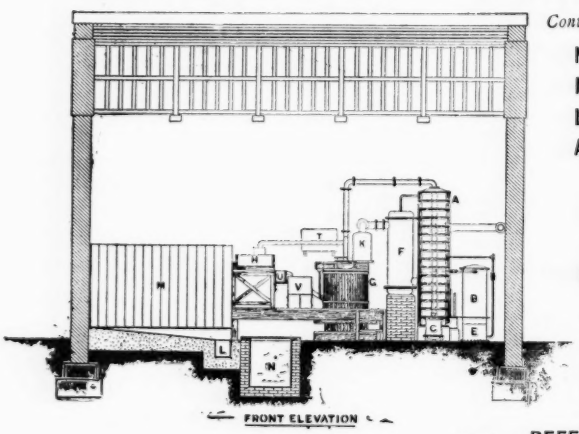

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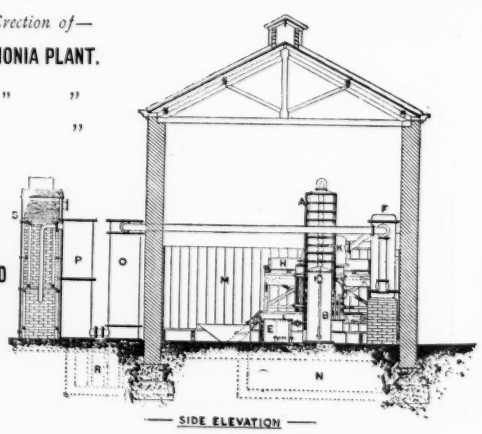

REFERENCES.

A. Large Still (Ammonia).
B. Small Still (Lime).
C. Spent Liquor Valve.
E. Limeing Arrangement.
F. Heater.
G. Saturator.
H. Draining Table.
K. Lead Catch Box.
L. Mother Liquor Well.
M. Sulphate Store.
N. Acid Store Tank.
O. Condenser.
P. Scrubber.
R. Settling Tank.
S. Neutralization Plant.
T. Acid Supply Tank.
U. Mother Liquor Trough.
V. Mother Liquor Receiver.

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Wilton's Patent Neutralizing Apparatus for the Waste Gases from Sulphate of Ammonia Plant.

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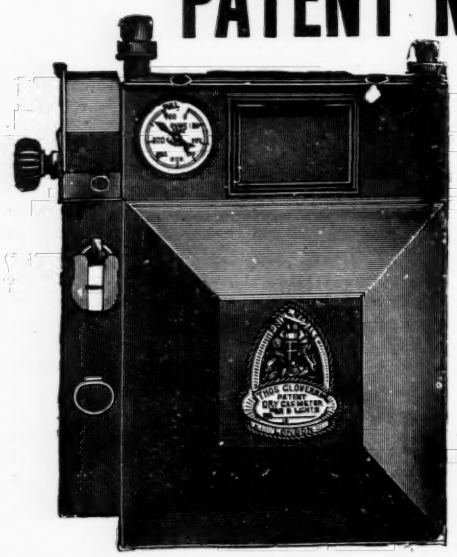

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EDITORIAL NOTES.

The Latter End of the Crystal Palace District Gas Company's Bill.

THE Crystal Palace District Gas Company's Bill came before the Committee of the House of Lords again on Wednesday, when the proceedings were confused by the unbusiness-like conduct of the London County Council, who, having had from the adjournment on the previous Friday to prepare clauses dealing with certain matters which were understood to be subject to agreement between the parties, had neglected to supply the other side with the drafts. Consequently, their Lordships had to further adjourn the matter until the close of the day, when it turned out that, as usual, the Council wanted all their own way. It had been notified to the Committee that the clauses on which the Council had opposed would be withdrawn; so that all that remained was the framework of the original Bill, and some provisions which can very well wait. Whatever prospect there might have been of the Company electing to take what they had secured and leave the rest for another assay, was probably destroyed by the "casual" way, as Mr. Cripps described it, in which the County Council plumped in their new clauses at the very last moment. However this may be, the fact remains that, in the judgment of the Directors of the Company, the mutilated Bill is not worth having; and the announcement of its abandonment which we made last week holds good.

It is a very grave question, as to how industrial progress in the United Kingdom is to prosper, with such obstructionary forces against it as were marshalled at the bidding of the London County Council on this occasion. This is not to say that everything any statutory gas company may be advised to ask for is to be granted by Parliament as a matter of course. Yet it is arguable that the parliamentary control of such an industry as gas supply is intended to secure certain broad advantages to the public—such as, the proper financing of the undertaking, the protection of co-existent rights, and fair treatment of all parties concerned. So long as these things are not imperilled, it would appear to be a reasonable view that the actual undertakers are entitled to be heard with respect when they propose alterations in the ordering of any manufacturing details. When, for example, as in this case, the Company ask to be given the same amount and kind of manufacturing scope which others enjoy without question—which, in particular, local authorities engaged in the same business exercise at will—it strikes one as outrageous that public funds should be lavished upon the creation of a wholly hypothetical opposition. And such evidence, too, as resulted from the efforts in this sense of the London County Council! We mentioned last week two or three of the fine flowers of "Science" that bloomed on this occasion, and will now only give additional publicity to just one more. That most careful and amiable of leaders of the Parliamentary Bar, Mr. Freeman, K.C., was cross-examining Sir George Livesey, who had just declared that the whole object of the Bill was to cheapen the supply of gas to the consumer. He asked this question: (Q. 261) "I put it to "you that, if you really work out these matters in the way you "yourself have been giving them to us, the consumer will "only receive a penny, but he will lose practically 1s.?" (A.) "I cannot answer a question of that sort. It is abso-"lute nonsense. He does not lose 1s., and he does not lose "a penny. That is my answer." So that Counsel must have been instructed by the collective intellect of the official opposition that to lower the penalty test limit of gas from 15 to 13 candles, and do away with lime purification for sulphur compounds, would inflict a loss on the consumer of 1s. per 1000 cubic feet in the amount of his gas bills. The sense of the whole gas industry will applaud the vigorous classification bestowed upon this treatment of the issue by Sir George Livesey.

Of course, it is right that all such proposals as those contained in the Bill should be carefully considered and criticized, but with reason, and without those offensive imputations of bad faith in which the London County Council seem to revel. It is, on the other hand, quite fair to contend that the public should have the whole benefit of all manufacturing economies which those who are best acquainted with the conduct of the gas industry are desirous of introducing from time to time. The industry is sometimes accused of being unprogressive, and too much given over to routine; and the recent experience of the Crystal Palace District Company will not encourage others to try to break away from the comfortable monotony of custom. The forces of growth and development, however, are not to be kept down everywhere by the dead-weight of bureaucratic prejudice. Probably the Board of Trade would be found amenable to reason. It is therefore quite pertinent to suggest that the real problem for the superior control of gas companies is that of securing the full benefit of industrial and economic improvements for the public, consistently with the retention of a sufficient interest of the company in the result to supply the necessary motive for the adoption of the improvements as they arise.

It has always been admitted in the "JOURNAL," and has nowhere been contested, that, in principle, no gas company should be entitled to make more profit out of the supply of one quality of gas in place of another found to be less suitable. This admission covers all questions of illuminating power and purification that have yet arisen. The difficulty is that where the gas company are not trusted to act upon this rule without special obligation to do so, they can hardly be forced into action by artificial regulations. It is quite impossible to make a gas company enterprising and progressive by Act of Parliament. Not even the sliding-scale of British gas supply is competent to operate itself in the right sense. In the case of the Paris Gas Company, there is the oft-cited obligation of the "Treaty" to reduce the price of gas by the amount saved by any scientific or technical improvement, which covers just the principle in question. The price of gas in Paris has not been reduced by a fraction since the enactment of this stipulation, many years ago. For a very good and sufficient reason, which never occurred to the sapient professors of science who incubated this notable provision. The determining factor in the cost at which gas can be sold is of an industrial and commercial nature, not technical. Science and technics bear only upon manufacturing costs, which merely form part, and not the most influential part, of the total expenses of the business. A good business manager saves all he can; but he does not expect that every economy and improvement will reappear proportionally in the price at which he can afford to sell his commodity. A 10 per cent. manufacturing advantage is reduced to less than half as much at the counter. Of course, doctors of science do not understand these things.

To keep to the case in point. Assuming that a relaxation of the penalty testing of a particular gas supply by two candles is worth 1d. per 1000 cubic feet to the company concerned, and that the abolition of lime purification for sulphur compounds may be worth another penny, the question is how to make sure that the public will get the full benefit of these economies, if realized. We cannot see any other way than by trusting to the sliding-scale to make a fair division of these as of all other business gains, and to the enterprise of the company to set them afoot. If the company will not move, nobody can make them. Why any local authority should put themselves athwart the course of a gas company anxious and willing to make gas ever so little cheaper, is one of the mysteries of our age and country. The answer can only be, that these bodies, unless they are in the gas business themselves, do not understand it. When they want guidance, they do not apply to their similars who are in the trade, but rather allow themselves to be misled by a troupe of unpractical persons who are called "professors," to distinguish them from persons who do not merely "profess," but do things that are men's work in the world. It is a queer road to attain the "efficiency" prescribed by Lord Rosebery.

The Affairs of the Manchester Gas Department.

In another column will be found the leading particulars of the past year's working of the Manchester Corporation gas undertaking, which contain some highly significant figures. The output for the year exhibits a decrease of about 33½ million cubic feet, or 0·69 per cent., which succeeds an increase for the previous year of nearly 3 per cent. This reversal of the usual order of things should serve as a timely warning to the Administration that gas supply is not an operation of Nature, which asks nothing from human care or effort, but is a trade that requires constant looking after and adjusting to ever-changing conditions. Having regard to the fact that the number of consumers continues to grow satisfactorily, though the quantity of gas consumed is less, the natural conclusion is that economical methods of burning the gas are growing in favour. This is another way of saying that the incandescent burner is making headway in Manchester, as elsewhere. The special reduction in the price of gas sold for power purposes has only operated for half the account year; so that its influence, if any, is not yet apparent. The amount of gross profit earned on the year's working was £222,482. After paying interest and sinking fund charges (the latter in excess of the former), there remained as net profit the sum of £133,478. The contribution towards the relief of the city rates took £50,000 of this; and the not inadequate allocation of £72,673 was placed to the contingent fund account. Moreover, it must not be overlooked that the price of gas has been reduced by 3d. per 1000 cubic feet as from Midsummer, and at present stands at 2s. 6d. within the city and 2s. 9d. outside. This is very fairly progressive, for Manchester, which has been long years in learning how to treat the Corporation gas estate. As it is, the price of gas has to bear an abnormal load of expense, including practically all the new capital outlay required. There is reason to believe that the upkeep of the various works is much more creditable now than was formerly the case, when the vast undertaking was left to manage itself. Manchester could well afford to sell gas for 2s. per 1000 cubic feet in the city, if the Corporation would only abandon the vicious system of indirect taxation of the trade which is an evil tradition of the place. Perhaps even this will come in time.

Non-Fiscal Hindrances to British Trade.

Spokesmen for various leading lines of national trade and industry are following up the helpful plan of examining the fiscal problem in the light of their business knowledge, initiated by the "Journal" in respect to the coke trade. It is the only way of deliverance from barren generalities, which, upon examination, usually turn out to be mere prejudices. The latest witness of this class whose observations have come under our notice is Mr. J. W. Barclay, the Chairman of the Electric Construction Company. Speaking at the recent ordinary general meeting of the Company, Mr. Barclay mentioned the competition which the concern has had to meet, principally from Germany. It does not require to be explained how British orders for electric plant have been run after by German tenderers, who are perfectly at liberty, under the national system of free imports, to compete with home firms. Mr. Barclay is not afraid of this competition, nor of anything which originates in America, whether manufactured on that side of the Atlantic Ocean or on this shore. He justly observes that no Protective ordinance will avail to shield the native manufacturer from the competition of firms which come over and set up works here. In his opinion, British industries suffer much more from legislative interference and restrictions, and from the mistaken notions of those who think they are furthering the interests of working men, than from any foreign competition. Thus, all sorts of obligations are imposed by law upon the British manufacturer, and he is told what rates of wages he must pay his workpeople; and then the public authorities who make these stipulations for political reasons go and give their orders to foreign contractors who cannot be bound by anything of the kind. "If that is Free Trade," as Mr. Barclay remarked, "it is an aspect of it that ought certainly to be the "subject of inquiry."

It is to be hoped that those British manufacturers who think thus will drive the point home, by collecting evidence as to the quantity of work that has left the country since the "Fair Wages" clauses were introduced into the contracts of public bodies, from Government downwards, where the clauses might be reasonably regarded as a burden on the cost of working. One constantly hears of large contracts for pipes and bars going abroad for the merest trifle of difference in prices. Doubtless it is for the British buyer to make the best terms for himself; but he should not tie the hands of those of his compatriots who would make short work of the foreigner if they were free. It is not the chance parcels of cheap articles, thrown upon the English market to make whatever they will fetch, that need frighten the British manufacturer. These are the unhealthy products of an exaggerated Protectionist system which hurts those who are subject to it more than it injures outsiders. Their effect is ephemeral and unimportant; but the mischief of that kind of Protection which regards the workman only, and not the product of industry, which is called Trade Unionism, is ever with us, and strikes at the root of national prosperity.

Possibly people have already forgotten the much-advertised "Mosely Commission" of personally-conducted Trade Unionists to the United States. The results were not great, from any point of view. But one of the most impressive of the lessons brought home by these not altogether open-minded pilgrims to the Land of the Free was that confessed to by Mr. Barnes, the Secretary of the Amalgamated Society of Engineers, who declared it to be his final conclusion that the lot of the mechanic in the United States is economically about 25 per cent. better than that of his British fellow in occupation. Why is this, assuming it to be true? That is the question—to be answered in the light of the fact of two very important American engineering companies having lately elected to start in business in England, in which enterprise they appear to have found no sort of difficulty. Which costs more, an American or an English made Westinghouse gas-engine? It is a curious question, not to be answered by quotations from price lists.

A Curious Case of Nuisance.

Of all the troubles that beset the gas manager, the nuisance difficulty is apt to be one of the worst to deal with. Time and again those in charge of what seems to them to be the most innocuous of gas-works will find themselves faced with complaints of "abominable smells proceeding from the "works," which appear to be just as usual. On the other hand, no gas manager will take it upon his conscience to declare that his works never by any chance disengorge any objectionable odour. Only, it is rarely that a mishap of this kind gets anybody into trouble. The most atrocious emanations accidentally or ignorantly caused will often escape notice, while something quite small or barely discernible close at hand will keep up a public agitation for years on end, and finish in a tedious lawsuit. Of course, there is something in having a bad name; and it is the habit of most people living in the neighbourhood of a gas-works to put every offensive odour to the discredit of the works, though these may be quite innocent of any offence. And there are strange coincidences in this regard. The truth is, of course, that though the natural man believes he can identify any number of separate and distinct bad smells—the great richness of the city of Cologne in this respect is traditional—there are not really so many different urban stinks as is popularly imagined. The strong family likeness of these interesting products leads to confusion on the part of those who would trace them to their sources. There can have rarely been so remarkable a case of "falseness "of scent," however, as that lately reported in all soberness by the Chief Inspector of Alkali-Works from Torbay. The sea went "sick," and a state of things was brought about which will be found described in the "Rime of the "Ancient Mariner." This is really not so rare a phenomenon as landsmen who have never observed what sometimes happens to ponds and sluggish rivers would suppose. All expanses of water are liable to "go bad," and smell offensively, if insufficiently aërated. Then everybody living within a mile or two of the spot will accuse the nearest gas-works of being the culprit. Sometimes the mischief is ascribed to pollution by sewage; but simple staleness of the water is enough to account for it in many instances. And when one remembers that water is the Universal Solvent, and that every drop of it on the surface of the globe, fresh or salt, has been here from the beginning and cannot be changed, the rarity of any defect of sweetness appears altogether miraculous.

Official Gas Testing—A Suggestion.

In concluding a valuable communication to the "JOURNAL" on the subject of "Gas and Gas Testing," Mr. H. Leicester Greville puts forward a suggestion which will be of considerable interest to gas engineers and managers at a time when the question of gas testing is occupying so large a share of their attention. He points out that the determination of the proportion of sulphur and ammonia in gas is made by a method which practically represents the mean of a day's supply, and the sulphuretted hydrogen test is on the same basis, and asks why should not a similar principle be extended to the testing for lighting power. It should not, Mr. Greville says, be a very difficult question of mechanism, by means of a delicate governor and clock connected to an experimental meter, to deliver an even proportion of gas per hour into a standard holder. With suitable precautions, the average quality of the gas supplied during the whole day could then be reliably and expeditiously determined.

A First-Cost Comparison for Horizontals and Inclines.

The paper by M. Frère, of which we publish a translation in another column, is one which should not pass without special notice; for in it he essays to present to members of the Société Technique du Gaz a comparison between the first cost of inclined and horizontal retorts, which is a matter that has puzzled and worried a good many gas engineers who have only had experience in the constructional work appertaining to the latter system. Additional interest is imparted to the comparison by the fact that he has chosen, for the horizontal retorts, charging by the De Brouwer coal-projector and discharging from one end by a ram. Notwithstanding M. Frère's laudable anxiety to make his comparison as near uniform in conditions as possible, it is transparent that his fancy bends in favour of inclined retorts. Giving him all credit for his endeavour to hold the balance fairly, we must say, from our independent position, the paper is an addition to the illustrations that have gone before of the difficulty of getting from engineers perfectly comparable conditions between the two systems. At the same time, the first cost of the two systems, as compared by M. Frère, comes out remarkably close. He takes as his basis a retort-house on each system, completely equipped—from four arches of nine 20-feet retorts, with all the appurtenances, right through to the coke-conveyor. The cost of constructing and fitting the inclined retort-house amounts to £6501, against £6850 for horizontal retorts, or a difference of £349 in favour of the inclined retorts. To meet the objection that may be raised that for the horizontal house he has provided two hydraulic mains per arch as against one for the inclines, he makes a deduction, which brings the difference down to £99 12s. This is a deduction of which with 20-feet horizontal retorts it is unnecessary to take account. Supplementing the paper is a table which shows in detail how the author has arrived at his figures, and, detailed though it is, there are a few explanations required on points which appear to impair the fairness of the comparison. However, before leaving the paper for the table, there is a reference in the former to the use of machines for charging and discharging which arrests attention. M. Frère mentions that this use leads to an expense for power and to charges for maintenance in one case which are not found in the other, and which are not compensated for by a reduction in labour. He quotes in proof figures given by Mr. Drory in an article in the "JOURNAL" in 1902, which figures equalled 15·696d. per ton of coal carbonized for horizontal retorts and 10·8096d. for inclined retorts. It may be pointed out to M. Frère that these figures are not admissible in his own paper, seeing that he is dealing with the De Brouwer machine, which is capable of charging 20-feet horizontal retorts from one end, while Mr. Drory was dealing with horizontal benches with machines on both sides.

M. Frère's Table.

Now let us examine the figures from which M. Frère has drawn his favourable figures for the inclined installation—not for the special purpose of proving that the advantage is on the other side, but to indicate two or three particulars in which we, without explanation, consider there are flaws in the comparison. Over the first set of figures we come at once to grief; for it passes comprehension why excavations and concrete for the inclined bench foundations should cost less than those for the horizontals. This is made the more strange when it is seen in the next set of figures that the exterior brickwork of the inclined retort arches, including end walls, is estimated to cost nearly £200 more, and in the succeeding set the blocks, retorts, and fire-clay brickwork, about £429 more. If the increased money spent on the inclined settings means a corresponding excess in weight, then the inclined benches, under this comparison, will have (to use a moderate figure) an extra weight in comparison with the horizontals of at least 25 per cent. If this is so, how comes it that cheaper foundations will suffice for the inclines? The difference, it is true, in the cost of the foundations, is not large; but it is well to have the comparisons perfectly blameless. All the following items may be passed over until we come to the prices entered for the charging and discharging machines for the horizontals; and on these two items we find the author has lumped sufficient to account for all the excess difference shown for his inclined benches up to this stage, and the excess difference of £349 in the total cost of the two installations. We admit, of course, that the excess is not all superfluous; but part undoubtedly is. For discharging the inclines, nothing is required; and the cost of the charging apparatus is put down at £126. For the charging apparatus for the horizontals—bear in mind M. Frère is dealing with the De Brouwer projector, which is capable of dealing with a 20-foot retort from one end—he puts down £701 8s. And why? Because, in his generosity, he gives the horizontals an extra machine as a reserve! The reason for this is beyond our understanding, as it is certainly not the custom with the older type of machines to provide any such reserve. Then the cost of the discharging-ram he enters at £440. It would be of interest to know where he obtained this figure; for, in comparison with the cost of the *two* charging-machines, it looks a little out of proportion. If the figure is for the Parisian telescopic ram, off-hand (without making a critical examination of the parts) we should say that M. Frère has put down a very liberal commercial value for it. It is unnecessary to go further into the comparative figures; but this examination does not carry conviction that here we have an irreproachable computation of the first cost of a 60-ton per day inclined retort-house and a horizontal one with a De Brouwer charger.

The Vertical Retort Twenty-Five Years Since.

In the renewed interest that is now being taken in the question of vertical retorts, it is only right that a full measure of honour should be accorded to Mr. C. F. Dieterich, who nearly a quarter of a century ago patented a system of constructing vertical retorts that has a very close resemblance to one at all events of the present-day proposals, and of the existence of which, it may be imagined from certain statements that appear in Dr. Bueb's specification, he cannot have been aware. The specification of Mr. Dieterich is of a particularly comprehensive character; and, to show the full extent of the inventor's claims and the merit attaching to his work, we publish it practically in full in this issue. The specification dates back to 1880; and the patentee is in that year perfectly conscious of the fact that even before then vertical retorts had been proposed with lateral outlets at different heights of the retort. His knowledge was apparently not that of Dr. Bueb 22 years later; for this inventor, in his reference to previous work, states: "In all such vertical retorts, the gas left the retorts only at the upper part—usually through a side outlet thereat; and the gas produced at the lower part of the retort had to pass through the whole column of incandescent charge before it could escape." His method of overcoming this disadvantage is by the provision of a lateral "outlet or outlets extending throughout, or practically throughout, the length of the retort, in communication with a passage which is not in direct contact with the furnace by which the retort is heated." His illustration shows the lateral openings inclined towards the interior of the retort. In 1880, Mr. Dieterich's projected system of vertical retorts embodied lateral openings "at different heights, through which the gas as produced passes into a channel communicating with a stand-pipe, without necessarily going through the heated mass above it;" and, in addition, these lateral openings were inclined so as to prevent coke lodging in them. While the patentee in 1880 knew of previous proposals for vertical retorts with lateral openings, he was not aware of the existence prior to his invention of a retort, or series of retorts, having lateral openings at different

heights arranged round the circumference of the retorts, and channels to receive the gas discharged through the lateral openings, and to convey the gas to a stand-pipe. Another curious feature in this old specification is that the patentee illustrates one form of retort with a sharper bottom bend than that used in the Settle-Padfield system, and with the lateral outlets as in the Bueb retort. But it will be remembered that the Settle-Padfield invention has relation more to the mode of introducing the coal into the retorts, the means to be employed for this purpose, and the mode of arranging or setting the retorts. Mr. Frederic Egner calls attention to the 1880 invention in our "Correspondence" columns. From his letter it appears that Mr. Dieterich's whereabouts is known; and it will be supremely interesting now if we can obtain from him some account of his experiences with the 1880 invention, and the reason why the development of the system was not prosecuted, or was unsuccessful at the time.

Workmen's Compensation and the Truck Act.

An interesting question with regard to the system adopted by a certain employer of labour to provide the sums necessary for meeting claims under the Workmen's Compensation Act was decided by the Judges of the King's Bench Division last week, on a case stated by the Justices for the County of Gloucester. The proceedings were taken at the instance of an Inspector of Factories, who summoned the employer before the Justices for having, in contravention of section 3 of the Truck Act, 1831, failed to pay one of his men in current coin of the realm the entire amount of wages earned by him. It appeared that since the passing of the Workmen's Compensation Act, this employer had been in the habit of paying his workpeople their wages in full, but that at the time of payment a slip of paper was handed to each man, with a sum equal to 2d. in the pound on the wages paid to him written upon it. The sum thus noted was thereupon handed by the workmen to the cashier, in order to provide for the payment of insurance premiums against accidents for which the employer was bound under the Act to make compensation. Inasmuch as the insurance was effected for a premium, per £100 of wages paid, of less than half the amount represented by these deductions, the employer actually made a profit on the transaction, besides making the men bear the cost of claims for which he himself was liable. The Court unanimously held that, whether or not the employer was entitled to act as he did, there had been no violation of section 3 of the Truck Act of 1831, as the insurance did not represent any payment made to the workmen in lieu of cash, but was effected entirely for the benefit of the employer. It would seem, therefore, that the employer in question has hit on a means of successfully shifting on to other shoulders the burden which the Act of 1897 sought to place upon his.

A Big Loan for Manchester.

The Manchester Corporation Gas Committee are contemplating the expenditure of over a quarter of a million of money upon structural and mechanical improvements and extensions at the three stations, new mains and services, and the provision of further meters and stoves. About £113,000 of the amount is needed for additional buildings and new apparatus; while the mains, meters, and stoves required will absorb over £140,000. The customary inquiry on behalf of the Local Government Board was held last week, at which there was the recital of progress in every direction which is fortunately a familiar feature of these functions when gas undertakings are concerned. During the past ten years, there has been an increase of 70 per cent. in the number of consumers; and good results are anticipated from the decision recently come to by the Council to abolish the charge for the hire of cookers. It is stated that the sum which it is now sought to raise on loan will complete the amount which the Gas Department are entitled to borrow under their existing Acts of Parliament.

Corporation Loans and Dear Money.

An example of the great difference between the terms on which our big corporations are now able to borrow money and those which existed a few years ago, is furnished by an issue of Liverpool stock at present under negotiation. The Corporation are desirous of raising £1,000,000, the interest to be 3 per cent., and the issue price 95, which, it must be admitted, compares unfavourably with the 2½ per cent. which they had at one time to pay on a loan issued at 98. Deducting bank charges, &c., the net amount they will receive will be only about £92 per £100 of stock. Of course, in the present condition of the Money Market, these terms cannot be considered unreasonable; but it certainly seems a pity that Liverpool should find it necessary to issue so large a loan (which is required chiefly for water and electricity) at such a time. It is exactly a twelvemonth since the Corporation raised a similar amount of money; so that, as one member pointed out, "they are spending apparently at the rate of £1,000,000 a year—a fact which should give them pause."

Illegally Disconnecting a Gas-Meter.

The question as to whether the person who actually does the work or the one who gives the order for it to be done is liable for the offence of disconnecting a meter without having given the statutory notice to the gas supplying authority, has recently been threshed out at the Goole Petty Sessions. The Goole Urban District Council, who are the owners of the gas undertaking, summoned the workman only; but the Bench, after a full hearing, came to the conclusion that the owner of the property was the responsible party. As, however, they agreed to state a case for the High Court, more is likely to be heard of the matter. The facts are simple. The defendant, when engaged on some other work at the Goole Co-Operative Stores, was asked by the Manager there to disconnect a meter. Being a plumber, he, of course knew that such a thing was not allowed; but on his pointing this out to the Manager, the latter said the meter was connected with another one, so defendant thought there would be nothing wrong in doing as he was requested. It turned out, however, that, instead of the meter in question being merely connected with another one through which all gas consumed would have to pass, the supply came direct to it from the main, so that the Council were unable to obtain a record of the quantity of gas used. It was therefore quite clear that someone was greatly to blame; and the only question that had to be settled was upon whose shoulders the responsibility should be fixed. The Magistrates' Clerk was strongly of opinion that the person giving the order should have been summoned; but on behalf of the Council it was contended that the man who "physically did the work" was liable. The Council declined to take any action against the Co-Operative Society; and therefore the Bench, adopting the former view, dismissed the case.

More Free Public Lighting.

The members of the Fenton Urban District Council—or some of them—are just now exercised in their minds over a question which has from time to time worried much more important bodies—that is to say, the fairness or otherwise of making the gas consumers defray the whole cost of the public lighting of the town. The Gas Committee decided that the lamps should be lighted "free;" and the Council have agreed to the adoption of that course. This was stated to be equal to a reduction in the price of gas of more than 4d. per 1000 cubic feet; but one member very truly remarked that the gas consumers and the ratepayers were not absolutely identical. He instanced one large establishment which, while doing nothing towards providing the profits of the gas-works, benefited to a material extent by the public lighting not being defrayed out of the rates. It is, of course, just such cases as this which give rise to the feeling that it is the fairer way to charge the cost of street lighting directly on the rates, so that all may pay for that from which all derive benefit. It may be perfectly true that at Fenton five-sixths of the money taken from the gas profits to cover the charge for public lighting goes back into the pockets of the consumers; it is the remaining one-sixth which affords ample material for argument.

The Effect of Dear Pitch on the German Coke-Ovens.

The "Kölnische Zeitung" recently drew attention to the unfortunate position of the German coal-briquette makers owing to the extraordinarily high price of pitch which has obtained of late years. Though this price has fallen quite recently, it is still above normal; and the briquette makers are, therefore, welcoming the news that the German iron-masters are about to erect

new coke-ovens which will give an increase in the annual output of pitch in Germany alone of about 30,000 tons. This supply will make the briquette factories of the Ruhr district wholly independent of English pitch. Our Cologne contemporary does not refer to the effect the concurrent increase in the output of other coke-oven bye-products will have on the market in tar and ammonia products generally.

Satisfaction at Nottingham.

As was to have been expected, there was nothing in the shape of criticism heard when the report of the Nottingham Gas Committee came before the members of the City Council. In the face of the improved results which the report shows, the Committee's critics find their occupation gone; and it is to be hoped that they may long remain in the ranks of the "unemployed." There is every reason to believe that this will be the case, seeing that further alterations in the works with a view to economizing the cost of manufacture have been in progress since the expiration of the period dealt with in the report. Another big step in this direction is indicated by a statement in the local Press to the effect that the Committee have for some time had under consideration the question of the advisability of lowering the candle power of the gas, though as yet they have not been able to come to any decision on the matter. It is not difficult to believe in the truth of the assertion that the Committee are giving their earnest attention to this subject, when one calls to mind the references to the illuminating power of the gas supplied at Nottingham which were contained in Sir George Livesey's recent report on the condition of the undertaking. In fact, the wonder would be were it otherwise, seeing the very emphatic manner in which Sir George summed up his remarks on this head—"I have therefore no hesitation in recommending you to reduce your 18½-candle power gas to (say) 14½ candles"—and the reasons which he gave for his recommendation. Still another matter tackled by the Committee is the naphthalene difficulty, which has made itself felt in Nottingham, as elsewhere. The Chairman announces that special precautions have been adopted by the Gas Department to overcome this trouble, and that there is no doubt these will be successful.

WATER AFFAIRS.

Plea for a Central Health Authority.

THE holding last week, in Bradford, of the annual congress of the Sanitary Institute, afforded another opportunity for the discussion of subjects bearing more or less closely upon the general question of the improvement of the public health. That this question has lost none of its importance, notwithstanding all the talk there has been upon it at these periodical gatherings of sanitarians, was fully shown by the papers submitted in the various sections. Though much has been accomplished since the formation of the Institute in 1876, a great deal still remains to be done to render the conditions of life of the working population more suitable for ensuring a continuance of those characteristics of the British race which have been so potent a factor in placing the Empire in the exalted position it now occupies among the nations of the world. That we are losing some of these characteristics, was shown by the Earl of Meath and the Bishop of Ripon in the debate which the former opened in the House of Lords on Monday night last week; and it is for such a body as the Sanitary Institute—representing as it does practically the whole of the important local authorities in the kingdom—to investigate the causes of deterioration in the *physique* of our urban populations, and suggest legislative measures for the removal, as far as practicable, of existing defects. Everybody knows that during the past quarter of a century there has been a gradually increasing incursion of the rural population into the towns; and they have consequently forsaken the pure atmosphere and freedom of the country for the closeness and confinement of the crowded city. It therefore becomes a matter of prime importance to make their new conditions of life as healthful as possible, and show them how they can themselves aid in securing this highly desirable result. Holding this opinion, the President of the Congress—Lord Stamford—did well to devote the bulk of his Inaugural Address to hygienic questions, and to emphasize the importance of educating the people, or their children, in the principles of hygiene, so as to make its practice by future generations instinctive or habitual. He impressed upon his hearers the duty, as advocates of sanitary progress, of "advancing the general intelligence of the nation to a "just appreciation of the supreme value of its chief asset—"public health."

In the course of his address, the President referred to the recommendation of the Royal Commission on Sewage Disposal, that a central authority should be established to deal with subjects relating to the sanitary conditions of urban and rural districts. The setting up of such an authority would, he thought, be of the utmost importance. It would form a new department of the Local Government Board, and its first duty would be to constitute Rivers Boards for suitable areas all over the country. But the President suggested that the functions of the proposed authority should include supervision and control over matters affecting water supply, on the lines laid down by the influential deputation who waited upon the President of the Board last October. Three points, it may be remembered, were emphasized by that deputation—viz., the pollution of rivers and other sources of supply, the abstraction of water from one district for sale in another, and the general question of waste. These matters might very well be placed under the care of a central authority, who, in conjunction with the Rivers Boards, would be able to provide machinery for dealing with the whole question of the protection of water supplies. In Lord Stamford's opinion, the scheme he had outlined might, without any considerable delay, be made the basis of legislation which would take us a long step onwards, not only in dealing with the question of sewage, but in solving the even greater sanitary problem of how to ensure to the whole population of the country an abundant and constant supply of pure, wholesome water.

Another phase of the question of the constitution of a new central authority was brought forward, in the "Sanitary "Science" Section, in a paper presented by Dr. Bushwell, of Plymouth, who advocated the appointment of a Minister of Public Health, with a seat in the Cabinet on occasions when matters concerning public health were under discussion. He contended that past experience tended to show that the embodiment of medical knowledge in the person of such a Minister, possessing proper status, and exercising organizing capabilities, would result in a steady diminution of the present wastage of human life, to a large extent by educating and guiding the public mind quietly and consistently in favour of health. He expressed the opinion that no greater spur to sanitary progress by local authorities could be devised than such an appointment as he was now suggesting, and that nothing could be better calculated to promote the best interests of all departments than a trained chief with adequate powers. His idea was that the Medical Department of the Local Government Board should be separated and enlarged, and form the basis of a Ministry of Health. The subject gave rise to one of the liveliest discussions which took place during the congress; and, in the end, a resolution framed in the above terms was carried. Dr. Bushwell's proposal is by no means new, having been brought forward at a previous congress of the Institute by Dr. Percy Frankland. The opinion is evidently gaining ground that the work of the Local Government Board is altogether too heavy to be coped with by a single department; and there seems to be no valid reason against such a division as the one contemplated in the resolution.

The Electricity Undertaking of the Primitiva Gas and Electric Lighting Company.—Exaggerated reports have been in circulation to the effect that the undertaking of the Primitiva Gas and Electric Lighting Company is about to pass into the hands of a German Electricity Company, who already carry on a large electric lighting undertaking in Buenos Ayres, and who recently, it is said, absorbed a competing French Company. The truth of the matter is that an agreement (which, it is understood, has not at present been consummated) has been arrived at, by which the electric lighting portion of the Primitiva Company's undertaking will be let at a rent for a term of 41 years—the agreed annual payment being at a rate that will liquidate the capital and return the Company fair interest. There is no doubt about this, that the Board of the Primitiva Company are not the men who would be likely to part with any portion of the concern without seeing a fair return on the capital invested in it; and the accounts and the statements made by the Chairman (Mr. H. E. Jones) at the last meeting of the shareholders show that the finer part of the Company's undertaking is that which they are retaining.

ESSAYS AND REVIEWS.

THE GAS AND WATER STOCK MARKET.

(For Stock and Share List, see page 123)

THE week just terminated was not a favourable one for the Stock Exchange. To begin with, the attractions of Henley and Lord's and the visit of the French President interfered with business. Then it was settlement week, and this demanded prime attention, although it proved to be a light affair unattended with difficulties. Notwithstanding these factors, things in general had a bright appearance at first; and there was a good firm tendency. But towards the end, a bad time set in for the American Market, coupled with some apprehension touching the Manchurian question, which entirely counteracted the opening ideas, and prices suffered accordingly. In the Money Market, there was a bit of stiffness apparent, and under the demand for the Stock Exchange and other quarters, the supply was not too abundant, though the position at the close ruled easier. Business in the Gas Market did not exhibit any revival of activity, though there was a little more animation apparent in one or two of the leading stocks. And the tendency was not buoyant, except in some of the debenture stocks; the ordinary stocks for the most part only maintaining their ground in cases where they did not actually give way. However, the actual changes in quotation were very slight either way. In Gaslight and Coke issues, the ordinary was only very moderately dealt in, and became weaker. Opening at 84¾, it kept up to this mark for half the week, and then gave way a point; 83½ being the figure at which it changed hands the next three days. The secured issues were unsteady. The debenture, which had been put up the week before, was now put down again. But the preference, which looked at one time like falling, finished firm. South Metropolitan was unusually active, and was marked up to 122½; but the quotation was left unchanged. A little business was done in Commercials at only moderate figures. There was not much doing in any of the Suburban and Provincial group, except Brighton; but prices were very fair. Southampton debenture advanced. In the Local Exchange, Newcastle debenture had a smart rise; but Sheffield "C" went down one. Business in the Continental Companies was quite moderate. Imperial was the most active, and showed a weaker tendency—the quotation falling a point. The only move in the remoter world was a drop of half a point in Monte Video. The Water Companies last week fell back into their old quiet state; and business was very inactive. The tendency was rather downwards; and Southwark and West Middlesex had a slight fall.

The daily operations were: Moderate business in Gas on Monday, without any change in quotations. Tuesday was a very quiet day. Imperial receded 1. Wednesday was more brisk. Southwark Water fell 1. Thursday was fairly active, but prices were not good. Gaslight ordinary and debenture relapsed 1 each, and Monte Video ½. Friday's transactions were more limited, and prices did not move. In Water, West Middlesex fell 3. Saturday was quiet and unchanged.

ELECTRIC LIGHTING MEMORANDA.

Parliament and the Electrolysis Question—The Muddle of Marylebone—The Bill to Amend the Electric Lighting Acts.

THE defence of gas-mains against the danger of electrolysis or fusion in connection with the general extension of electric tramways, has been well done during the past week's work in the Committee-rooms, Westminster. The Brighton and Hove Gas Company secured protection by the insertion in the Corporation Tramways Bill of a clause placing responsibility upon the Corporation for any damage to the pipes of the Company resulting from the use of electric current on the tramways authorized by the Act. In the Beckenham case, which was an opposition by the Crystal Palace District Gas Company for a similar purpose, protection was granted in a slightly altered form of words, limiting the liability to electrolysis. In both cases the petitioners also sought to have the principle of the Bermondsey Clause, making the municipal trading self-supporting, applicable to the undertakings. But this was only granted in the case of Brighton. It cannot, therefore, be said that the mind of Parliament is yet quite clear as to what safeguards against possible loss or damage should be imposed on local authorities in regard to their electric supply ventures. This irregularity of treatment of the gas interest by Parliamentary Committees does not tend to diminish expense or cause less trouble to the parties in these cases. Some approximation to uniformity of legislation is eminently desirable in this regard; but, instead of this, the disparity of conditions is perpetuated and accentuated week by week. The whole question at issue as regards gas-mains is whether the Board of Trade regulations are sufficient protection for gas and water pipes; and the Committees seem to think that sometimes they are and sometimes they are not. There is no key to the mystery of what is likely to be done in any particular case. The request of the gas companies is practically the same always. All they demand is that those who injure their property shall be held responsible for the damage done; whereas the tramway interest shelters itself behind the Board of Trade rules, and argues that so long as these are observed there is no more to be said or done. The trouble is that in numerous instances damage by electrolysis or fusion has been caused to gas-pipes by ostensibly well-regulated electricity supply systems; and there is no knowing how far the mischief may have already extended. In face of these facts, gas companies entertain a wholesome distrust of these regulations, which, besides, appear to be of a summary character. That is to say, the regulations take cognizance of the first and last of electric distribution, but are incurious as to what may be going on in between. The only thing to do is to patiently collect evidence, with particular regard to the proof of location. Photographs and accurate plans of what appears *in situ* are even more valuable than specimens of perforated and fused pipes produced for the edification of Committees, although the latter are, of course, very important pieces of evidence. Electricians are laudably keen in their own defence; and if they are able to identify a specimen as having done duty on several occasions, they make the most of the circumstance.

Yet another stage has been reached in the very remarkable development of the electric light question of the Metropolitan Borough of Marylebone. The Metropolitan Electric Supply Company's action against the Corporation for specific performance of the contract to purchase the local portion of the undertaking and business of the Company, has been decided in favour of the plaintiffs; the date of completion to be Dec. 31 next. Of the purchase-money, £100,000 was ordered to be paid into Court. This tremendous business was duly considered at a meeting of the Borough Council. In the interval, Counsel for the parties had met and agreed upon certain suggestions for a settlement. These, of course, proceeded on the assumption that the transfer is to be effected in accordance with the order of the Court. The terms appear to be reasonable in themselves, and the Council were strongly urged to accept them. This is all very well, as a matter of administrative detail; but, of course, it does not touch the root of the difficulty, which lies in the popular aversion to the whole transaction, and the hitch in regard to the financial powers of the Council. A meeting of this body, to take all these matters into consideration, was to be held yesterday; but the deadlock appears to be as complete as the most skilful deviser of "plots" for plays or novels could imagine.

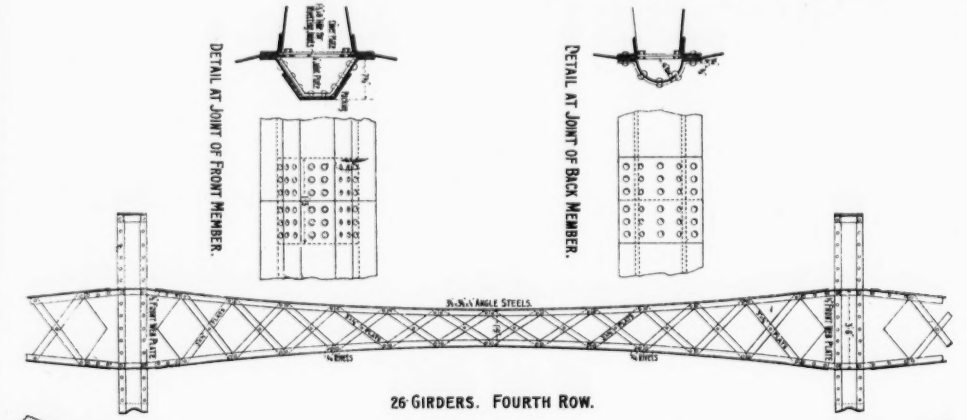
The short Supply of Electricity Bill, introduced into the House of Lords by Lord Wolverton, is a measure of considerable importance, both in itself and as a precedent. It is entitled "An Act to Amend the Electric Lighting Acts, 1882 and 1888;" and it is chiefly to empower the Board of Trade to include the compulsory acquisition of land for generating stations in Provisional Orders. This is an extension of the power of the Department which, if bestowed, is likely to have far-reaching effects. The Bill, moreover, does away with the localism of the Electric Lighting Acts, by making the powers of compulsory purchase apply to any land specified in the Order, whether situated within or beyond the area of supply, or, in the case of a local authority, of the district. For the purpose of bringing in a supply of electricity from an outside station, powers to break up roads may also be conferred. Electricity supply in bulk is also to be subject to the Provisional Order system. Another provision aims at the abrogation of the purchase clauses of the Act of 1888, in cases where the Board of Trade judge them to be inapplicable. Local authorities may be joined for the purpose of exercising electric lighting powers. Greater freedom is accorded to the Board of Trade as regards dispensing with the consents of local authorities to grants of Provisional Orders. Other alterations are proposed, with the object of bringing the general law of electric lighting into better accord with the business as actually carried on; and a very important clause defines the conditions under which premises separately served with electricity are to have the advantage of a compulsory supply. No person is to be entitled to demand from authorized undertakers a supply of the latter character, "unless he has agreed with the undertakers to pay them a reasonable return on the capital expenditure, and will cover other standing charges, incurred by them, in order to meet the possible maximum demand for those premises." It would appear that the old proverb about sauce for the goose being equally good for the gander might come into play here, and that some noble lord or member of the House of Commons might pertinently inquire whether any modification of the law of gas supply in the same sense would not be in order. It is particularly hard on those gas suppliers who do not charge meter-rent that they should be practically compelled to maintain emergency plant gratis, in order to protect consumers of electricity from the risk of being left in darkness.

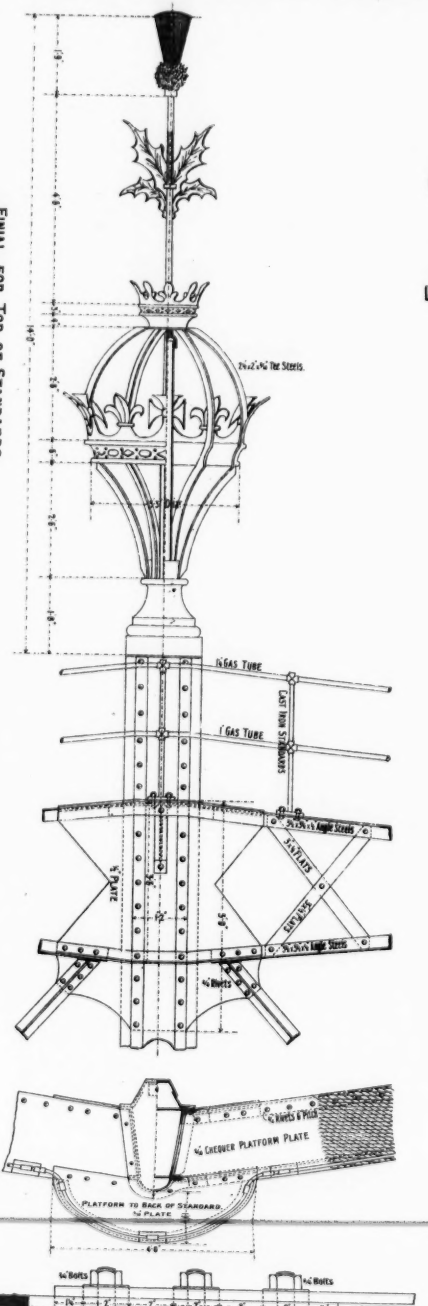
Electric Lighting Orders.—Last week the Board of Trade report on their proceedings under the Electric Lighting Acts, 1882 to 1890, during the past year, was issued. There were 67 Orders applied for, and 64 were made and confirmed by Parliament. From 1883 to 1902 inclusive, 1036 Orders were applied for, of which 807 were made by the Board, and 799 confirmed by Parliament. In the period named, 134 Orders were revoked or repealed—the largest number (62) in 1883.

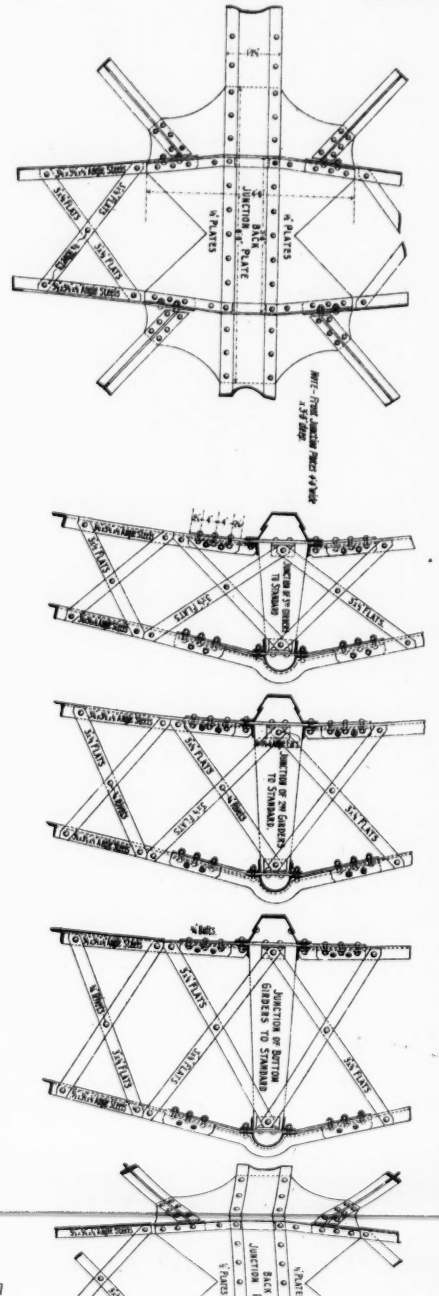
The Granton Works of the Edinburgh and Leith Gas Commissioners.

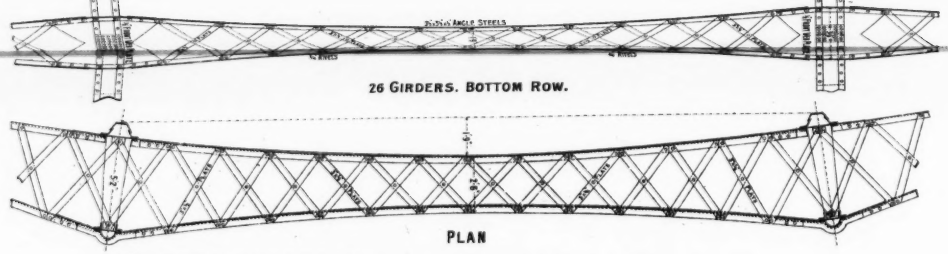
General Details of the Gasholder Guide-Framing, Girders, Finials, &c.

No. 26.


DETAIL AT JOINT OF FRONT MEMBER.
DETAIL AT JOINT OF BACK MEMBER.
26 GIRDERS. FOURTH ROW.
HALF PLAN OF BOTTOM FLANGE.
HALF PLAN OF TOP FLANGE.
26 GIRDERS. THIRD ROW.
PLAN
26 GIRDERS. SECOND ROW.
PLAN
26 GIRDERS. BOTTOM ROW.





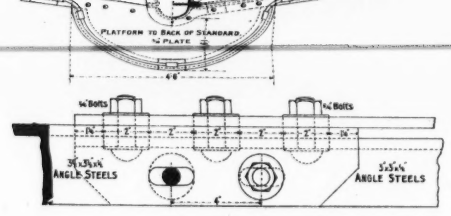


26 GIRDERS. BOTTOM ROW.

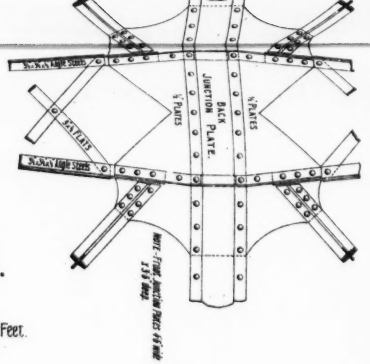
PLAN

GIRDERS FOR Nº 1 FOUR LIFT TELESCOPIC GASHOLDER.

Inches 12 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 Feet.

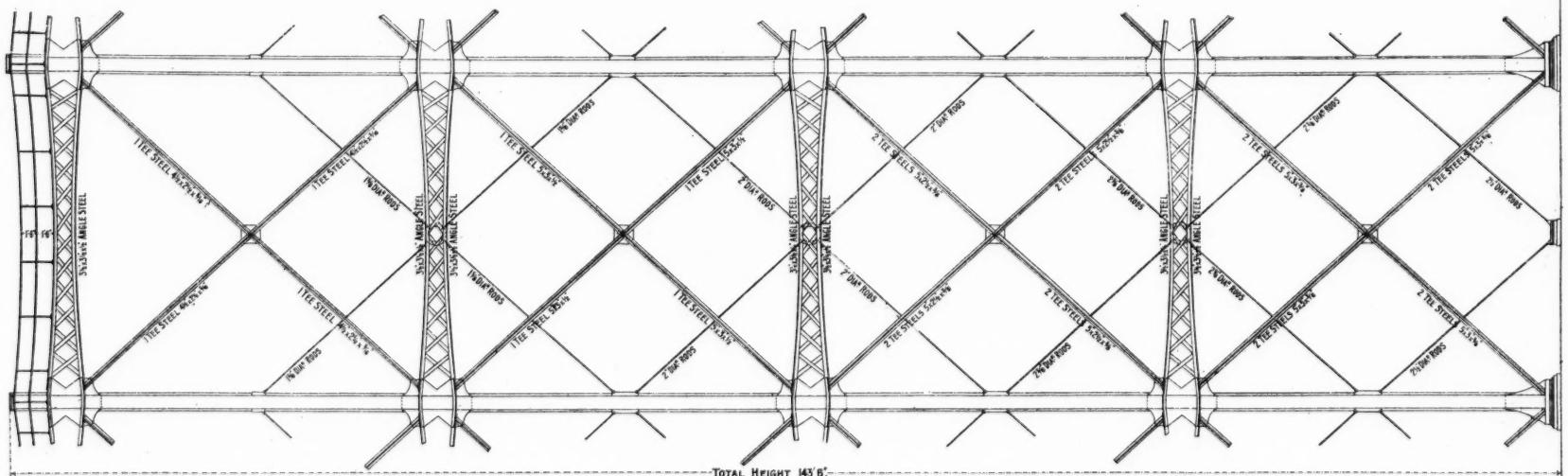


DETAIL OF JOINTS.



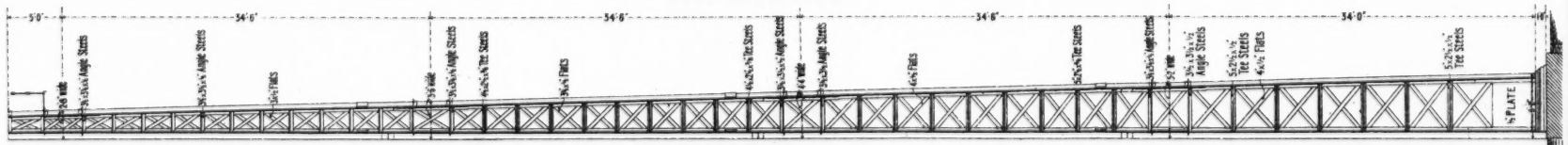
Nº 1 FOUR LIFT TELESCOPIC GASHOLDER. DETAILS OF GIRDERS.

Inches 12 6 0 1 2 3 4 5 6 7 8 Feet.

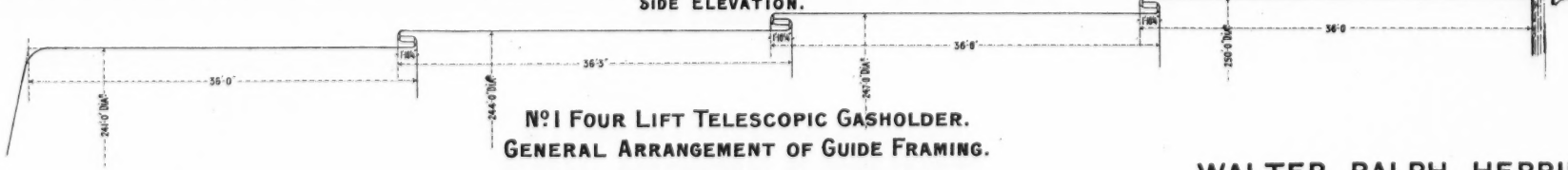


TOTAL HEIGHT 143'6"

BACK ELEVATION.



SIDE ELEVATION.



Nº 1 FOUR LIFT TELESCOPIC GASHOLDER. GENERAL ARRANGEMENT OF GUIDE FRAMING.

Inches 12 0 1 2 3 4 5 10 15 20 25 Feet.

WALTER RALPH HERRING,

M.INST.C.E., ENGINEER.

Copyright at Stationers' Hall.

THE GRANTON WORKS OF THE EDINBURGH AND LEITH GAS COMMISSIONERS.

DESCRIPTION PREPARED

BY

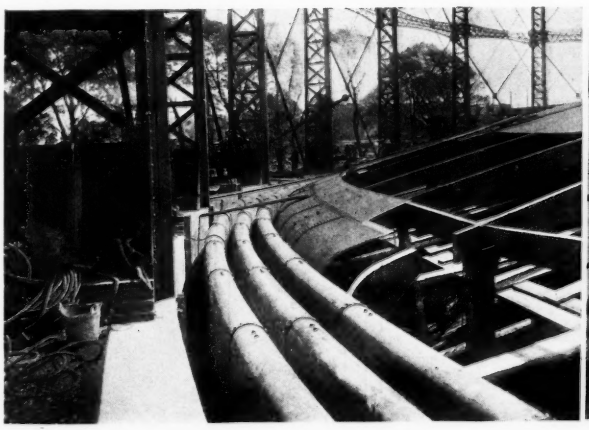
WALTER RALPH HERRING, M.INST.C.E., *Engineer.* *

ARTICLE XXVI.—Accompanied by Plate No. 26, giving General Details of the Gasholder Guide-Framing, Girders, Finials, &c.

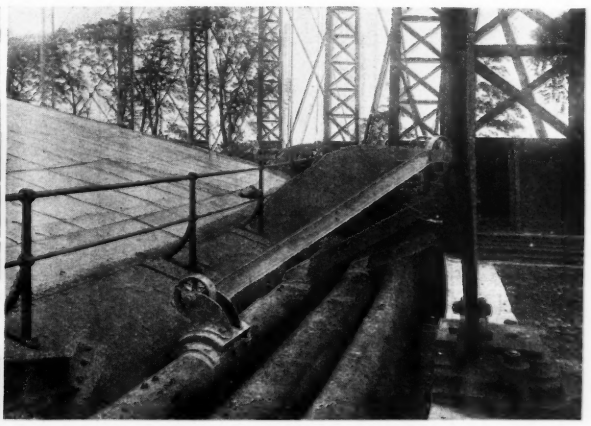
The locality of the works in relation to the surrounding district, demanded that some consideration should be given to the æsthetic disposition of the structures; so as to as little as possible affect the neighbourhood in which the works are placed. This particularly applied to a structure such as the gasholder, which has proved to be much more prominent for many miles around Edinburgh than I had any conception of at the time. At the outset, however, I paid particular attention to the design of the framing, so as to make its appearance as presentable as such a structure can be without adding unwarrantably to the cost of its construction for the sake of mere ornate effect; and while ample strength has been put into all its members (as will be seen from the table of comparative weights accompanying this article), it has been disposed in such a manner as to make the structure appear light, and in the eyes of many almost flimsy. Solid plate-work in the standards and girders has been supplanted by open trellis work throughout, and the upper ends of the standards have been capped with finials of somewhat inordinate (although proportionate) design, of simple coronet form supporting the national emblem. In fact, it is only in the finial that I plead guilty to having spent a penny more than was absolutely necessary for the construction of the framing as a structure.

The elevation of the coping of the tank is 73·35 feet above the sea-level, although it is only a couple of hundred yards from the water's edge. The total height of the structure is 157 ft. 6 in.,

PHOTOGRAPH No. 130.—The guide-framing of the gasholder. The lower sections of the main standards were erected by a steam locomotive crane, together with the first tier of girders.



PHOTOGRAPH No. 131.—Illustrating the brackets employed for the stiffening of the main curb of the gasholder.



PHOTOGRAPH No. 132.—The gasholder guide carriages and rollers—illustrating the guide-carriage to steady the upper lift.

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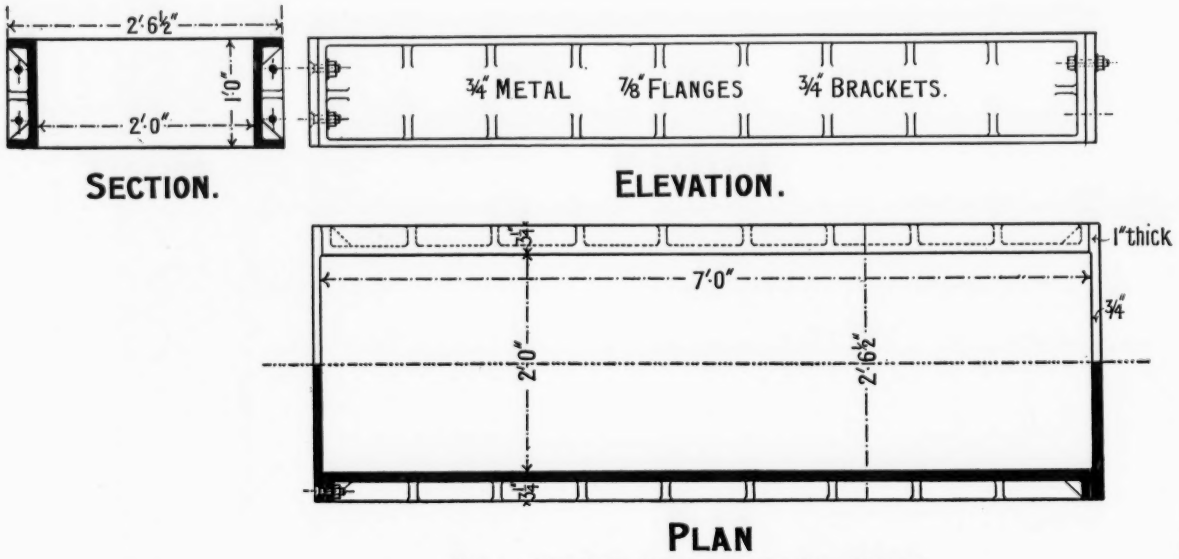


FIG. 1.—CAST-IRON BOXES FOR THE REST-BLOCKS.

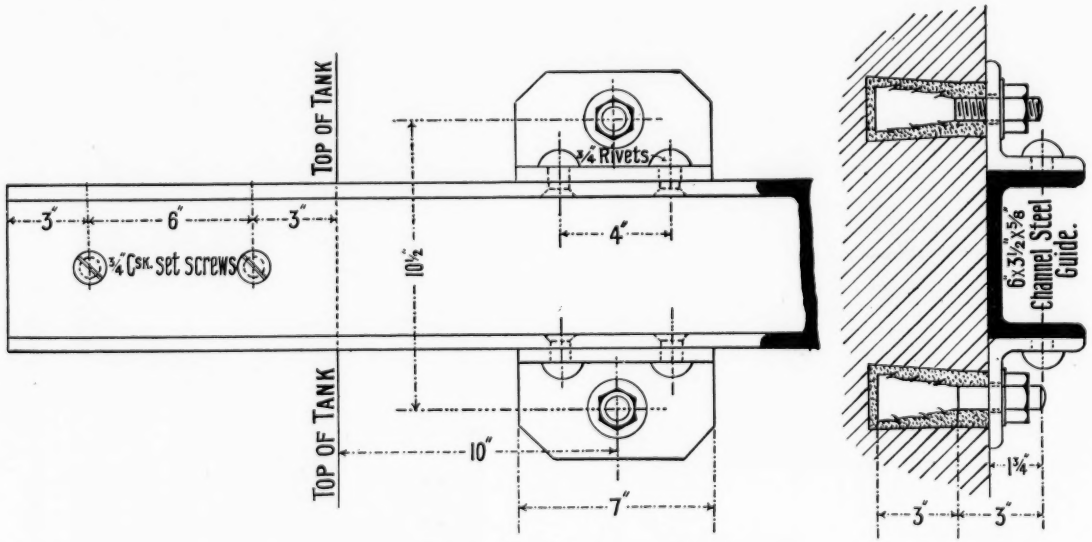


FIG. 3.—DETAILS OF THE TANK-GUIDES.

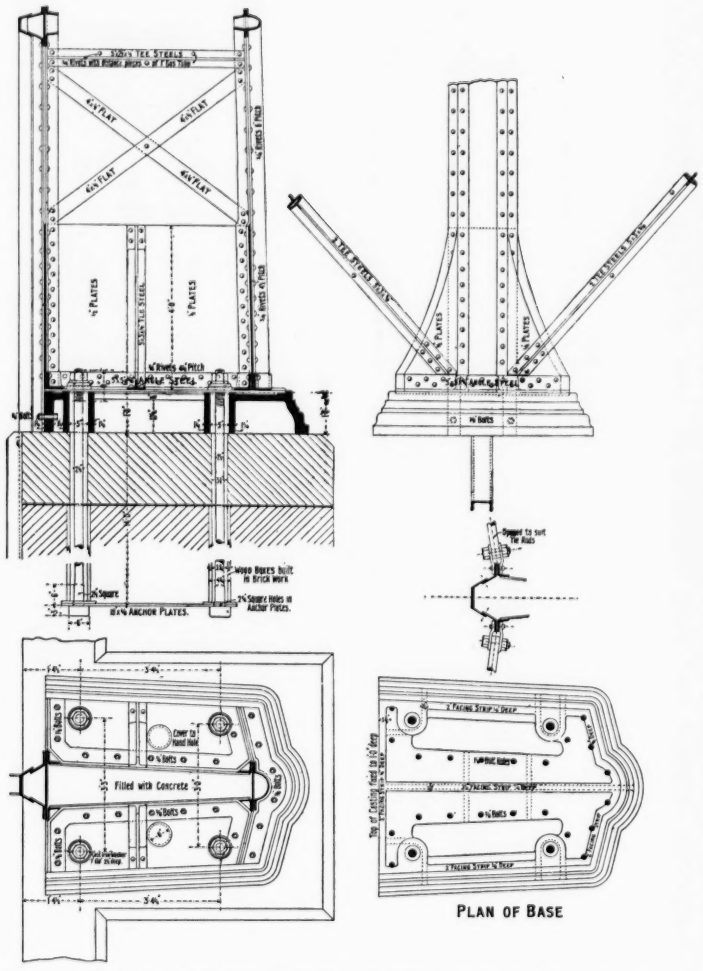


FIG. 7.—FURTHER DETAILS OF THE STANDARD SECTION.

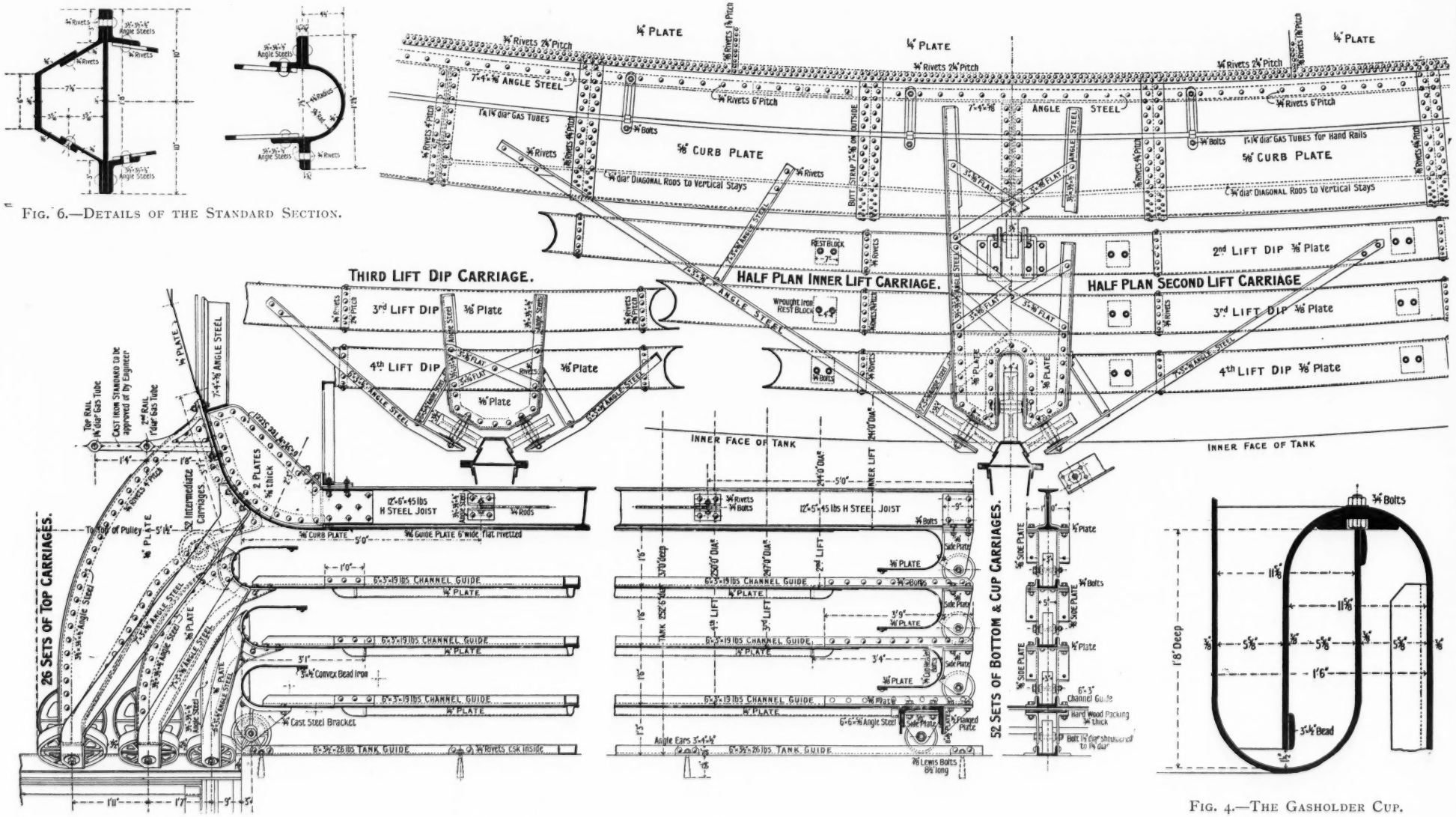

¼ Plate
¾ Rivets 2¼ Pitch
7"-4"×⅜ Angle Steel
1"&1¼ dia. Gas Tubes
⅝ Curb Plate
¾ dia. Diagonal Rods to Vertical Stays
Half Plan Inner Lift Carriage.
Half Plan Second Lift Carriage
2nd Lift Dip ⅜ Plate
3rd Lift Dip ⅜ Plate
4th Lift Dip ⅜ Plate
Third Lift Dip Carriage.
Inner Face of Tank
26 Sets of Top Carriages.
52 Sets of Bottom & Cup Carriages.
12"-6"-45 lbs H Steel Joist
6"-3"-19 lbs Channel Guide
8"-3½"-26 lbs Tank Guide
Cast Steel Bracket
Convex Bead Iron
Top Rail 1¼" dia. Gas Tube
2nd Rail 1" dia. Gas Tube
Lewis Bolts 8" long
Hard Wood Packing ¾ Thick
Bolt 1¼ dia. shouldered to 1" dia.
¾ Bolts
1'8" Deep
1'6"
¾ Bead

Fig. 6.—Details of the Standard Section.

Fig. 2.—Details of the Guide-Carriages.

Fig. 4.—The Gasholder Cup.

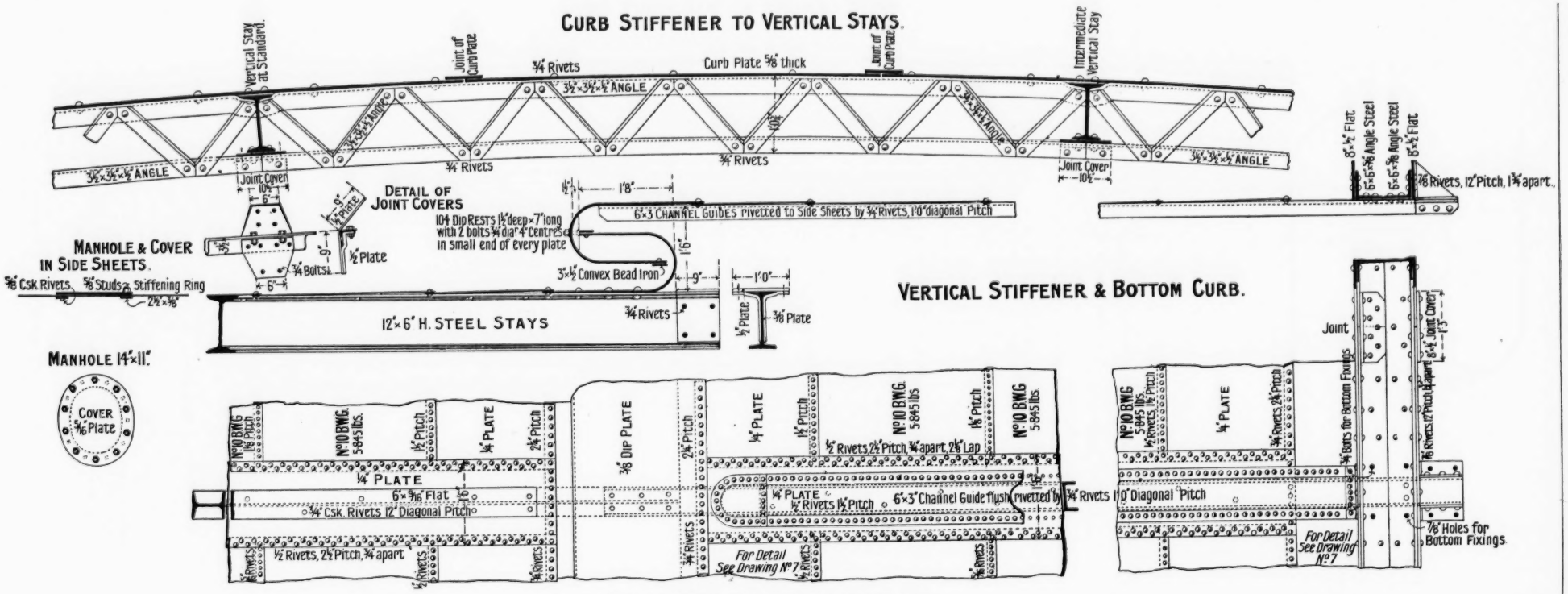

CURB STIFFENER TO VERTICAL STAYS.
Vertical Stay at Standard.
Joint of Curb Plate
¾" Rivets
Curb Plate ⅝" thick
Joint of Curb Plate
Intermediate Vertical Stay
3½×3½×½ ANGLE
¾" Rivets
Joint Cover
DETAIL OF JOINT COVERS
10½ Dip Rests 1½ deep × 7" long with 2 bolts ¾ dia. 4" centres in small end of every plate
6"×3 Channel Guides Rivetted to Side Sheets by ¾" Rivets, 1'0" diagonal Pitch
MANHOLE & COVER IN SIDE SHEETS.
⅝ Csk Rivets
⅝ Studs
Stiffening Ring
½ Plate
¾ Bolts
3"×½ Convex Bead Iron
12"×6" H. STEEL STAYS
¾" Rivets
½ Plate
⅜ Plate
VERTICAL STIFFENER & BOTTOM CURB.
MANHOLE 14"×11".
Cover ⅝ Plate
No 10 BWG 5845 lbs.
¼ PLATE
6"×⅜ Flat
¾ Csk. Rivets 12" Diagonal Pitch
½ Rivets, 2½ Pitch, ¾ apart
⅜ DIP PLATE
½ Rivets 2¼ Pitch, ¾ apart, 2½ Lap
6"×3" Channel Guide flush Rivetted by ¾" Rivets 1'0" Diagonal Pitch
For Detail See Drawing No 7
Joint
⅝ Bolts for Bottom Fixings
⅞ Holes for Bottom Fixings

FIG. 5.—DETAILS OF THE GASHOLDER CURB.

including the finials, and is fully exposed to gales from the North Sea as well as south-westerly gales sweeping down the valley of the Forth.

The data used in proportioning the holder—more particularly the framing—are the same as were used in connection with the Forth Bridge construction; both structures being only a few miles apart, and equally exposed to wind storms.

The gasholder has a total capacity of 7 million cubic feet. The contents of the crown being 425,270 cubic feet, the actual working capacity in and out is, therefore, 6,574,730 cubic feet. It is a four lift holder, guided to the top; the respective lifts having the following dimensions:—

First, or inner lift,	241	ft.	diameter	by	36	ft.	0 in. deep.
Second lift,	244	,,	,,	,,	36	,, 3 ,,	,,
Third lift,	247	,,	,,	,,	36	,, 0 ,,	,,
Fourth lift,	250	,,	,,	,,	36	,, 0 ,,	,,

The cups and curbs are 1 ft. 8 in. deep by 11⅝ in. wide; a greater depth having been given in the cups to allow for loss of water during the prevalance of wind storms. The crown is untrussed, and rises 18½ feet above the curb-line.

The tank, as already stated, is 252 ft. 6 in. internal diameter by 37 feet deep to the bottom of the rest-blocks. There are 52 rest-blocks, 12 inches deep, placed equi-distant around the tank (see fig. 1). These blocks consist of a cast-iron frame 7 ft. by 2 ft. by 1 ft. 6 in. deep inside, the top of which is set perfectly level by a natural water-line filling in the tank. The water was afterwards removed, and the interior of the blocks filled in with cement concrete in the proportion of six of ballast to one of cement; the surface of the blocks for a depth of 1½ inches being finished off with fine granite and cement in the proportion of 2 to 1. These rest-blocks are placed midway between the main piers and the intermediate piers, so as to leave clearance for the cup-fixings and guide-rollers, all of which are fixed beneath the bottom of the cups.

The difference in the depth of the second lift (amounting to 3 inches) was introduced to permit of a more satisfactory attachment for the fixings of the guide-carriages thereon, so that they might clear the guide-carriages on the third lift. This will be better understood upon reference to fig. 2.

There are 52 tank-guides consisting of 6 in. by 3½ in. by ⅝ in. steel channels. One set is placed in line with, and is continuous with, the main standards; the second set is on the face of the intermediate piers, midway between the standards; the latter projecting 12 inches above the coping level of the tank (see fig. 3), so that by no possible means can the holder rise sufficiently high to permit of the bottom rollers springing or projecting and catching upon the coping of the tank when it happens to be brimful of water, owing to the choking of the overflow pipe with leaves in the autumn and rainy season.

The untrussed crown is, when down, supported upon a pitch-pine timber-framing erected permanently within the tank. This portion of the work was described last week in connection with the tank.

The gasholder may be strictly defined as of the shallow description as compared with many others of similar size constructed within comparatively recent years.

The tank itself from the top of the rest-blocks to the coping-level bears the proportion of 1 in depth to 7 in diameter. The proportion of the inner lift is 1 in depth to 6·7 in diameter. This does not in any way approach Sir George Livesey's proportion of 1 to 10. But Sir George himself admitted—after delivering his highly interesting discourse "A Talk on the Development of the Gasholder," at the 1902 meeting of the Institution of Gas Engineers, in the discussion—that he would never put up a 1 to 10 holder if he could help it; that his sole reason for the shallow tank was "to save the expense of the tank." This was also my reason for determining upon a shallow tank, and is the point I particularly wish to make upon the present occasion. The old proportion of 1 to 4 or 5 should be finally abandoned, for good and all, as being an unnecessarily costly method of providing for our storage accommodation. I have already stated that the Granton tank is in the proportion of 1 to 7; the inner lift of the gasholder being 1 to 6¾.

The principal object in the construction of gasholders with shallow lifts is to ensure the level ascending and descending of the inner lift when it is working alone. The inner lift—which has to withstand the stress of the dome or crown, and also to carry the entire weight of the lower lifts—is of necessity stronger itself than its neighbouring lifts; and it is only a matter of keeping the framing of the upper lift in form during its ascent and descent when uncupped, that must be achieved in order to ensure success.

The framework of the upper lift may, therefore, be described as a separate structure (see fig. 2, also fig. 4). The cup is of the bent form, consisting of ⅜-inch plates bent to a true radius and riveted together, lap-jointed, by means of ¾-inch rivets, 2¼-inch pitch. The outer edge of this plate is stiffened by a 3 inch by ½ inch convex bead-iron, riveted to the ends of the ⅜-inch plate by ¾-inch diameter countersunk rivets, 6-inch pitch.

The top curb is formed by means of a bent ⅝-inch plate, struck to a radius of 2 ft. 3 in., bent to the circumferential line, stiffened by means of a 7 inch by 4 inch by ⅝ inch angle steel ring, riveted by ¾-inch rivets, 6-inch pitch, on its inner circumference beneath the crown, and by means of a Warren girder lying horizontally, consisting of 3½ inch by 3½ inch by ½ inch angle steel back and front flanges, with 3½ inch by 3½ inch by ½ inch angle steels diagonally arranged, as shown on fig. 5.

The outer flange of the Warren girder is riveted to the ⅝-inch curb plate by means of ¾-inch rivets, 2 ft. 6 in. pitch; it being also joggled and secured to the internal vertical stays by ⅞-inch diameter rivets. The inner flange of the girder is supported and secured to the inner flange of the vertical stays—this construction completely encircling the curb, like the hub of a wheel.

The internal side stays, both main and intermediate, consist of 12 inch by 6 inch by 45 lbs. H steels, projecting below the bottom cup a distance sufficient to allow of securing the bottom cup fixings, and riveted to the cup plate by means of ⅞-inch diameter rivets. The upper end of the vertical stay is riveted to the ⅝-inch bent curb plate. It is also continued, in the form shown, as a bracket supporting the entire breadth of the curb plate, and abutting upon the inner 7 inch by 4 inch by ⅝ inch angle-steel ring. The vertical stiffeners are still further secured by means of diagonal bracing internally.

At a point 5 feet from the base, and 5 feet from the curb-line, double angle-steel cleats, 3½ inch by 3½ inch by ½ inch are secured to the webs of the 12 inch by 6 inch H steels, forming ears between which ⅞ inch diagonal bracing is introduced—the rods being provided with right and left hand screw threads and box-nuts for tightening and adjustment (see fig. 2). By this means, the entire framing of the inner lift is perfectly secured.

To make doubly sure of the steady guiding of the inner lift when working alone, 52 intermediate guide-carriages were fixed upon the dip of the second lift, working upon a 6 inch by $\frac{9}{16}$ inch flat plate, secured to a vertical plate, 1 ft. 6 in. wide and ¼ inch thick, running the full depth between the cup and the curb plate. The vertical guide of the inner lift, therefore, consists of a 12 inch by 6 inch by 45 lbs. H steel joist, a ¼-inch plate 1 ft. 6 in. wide, and a 6 inch by $\frac{9}{16}$ inch flat plate riveted with countersunk rivets to the outside. The outer edges of the ¼-inch plate were drilled for receiving the ⅞-inch rivets, 2½ inch pitch, for securing the side-sheeting to the stays, one sheet 3 ft. 1 in. deep, centre to centre, of rivet holes by No. 10 B.W.G., by 13 ft. 4½ in. long stretching from stiffener to stiffener.

The vertical stiffeners of the intermediate lifts consist of 6 inch by 3 inch by ½ inch by 19 lbs. channel guides and ⅛ inch bent plate boom-stays, with a 1 ft. 6 in. by ¼ inch plate sandwiched between this plate, having the outer edges drilled for receiving the ends of the side sheeting.

The bottom curb of the outer lift consists of two 6 inch by 6 inch by ⅝ inch angle-steels, stiffened on the upper and lower flanges by means of 8 inch by ½ inch plates encircling the entire outer circumference; these members being riveted to the bottom plate by ⅞ inch rivets, 6 inch diagonal pitch (see fig. 2).

I do not think it necessary to deal further with the details of the construction of the holder. They are all so fully set forth on the accompanying plate that every information—down to the size and position of the smallest rivet, and every hole—is fully set forth. I may, however, refer to the system of guiding.

A combination of tangential and radial rollers were at the outset determined upon. The upper and second lifts have both radial and tangential rollers; the third lift is tangentially guided only; and the fourth lift, only radially guided.

The side sheeting has already been referred to as consisting of sheets 3 ft. to 3 ft. 1 in. wide, centre to centre of rivets, by the full length between the vertical guides—about 13 ft. 4½ in. The row adjoining the curbs and cups are ¼ inch thick, and the intervening sheeting of No. 10 B.W.G. of 5·845 lbs. per foot super; the bottom ring adjoining the bottom curb being ⅜ inch thick.

The question as to whether square or radial crown sheeting should be adopted was determined in favour of the radial sheeting. My own experience, and the holders that I had seen with the crowns covered with square or rectangular sheets, were not such as to induce me to deviate from the old-fashioned custom in this respect. A saving of a few tons of iron is nothing to compare with the necessity for a thoroughly tight and efficient crown.

With square or rectangular sheeting, it is impossible to bring all the rivets upon the same plate under equal strain. The crown is dome-shaped; and the plate of necessity must be dome-shaped. The fact that, in the first instance, these plates are cut true and square makes it absolutely impossible for them to be in true and perfect line when domed. The difference is made up by the riveters in rhymering the rivet holes; and, upon inflation, the holder crown must of necessity be subjected to many transverse and diverse strains which do not come into play in a crown with sheets radially cut and riveted.

The centre crown plate is $\frac{5}{16}$ inch thick and 5 feet in diameter; and the adjoining row, $\frac{3}{8}$ inch thick by about 7 ft. 6 in. long, riveted to the crown plate by ½ inch diameter rivets, 1½ inch pitch. The outer row of crown plates, adjoining the ⅝ inch curb plate, is ¼ inch thick by 2 ft. 9 in. wide, riveted to the curb plate by a double row of ¾ inch rivets, 2¼ inch diagonal pitch, 4⅛ inch longitudinal pitch, and ⅞ inch apart on the circumferential line. They are single riveted to each other by means of ⅝ inch rivets, 1⅞ inch pitch, and to the crown sheets by ½ inch diameter rivets, 1½ inch pitch. The intermediate crown sheets are in lengths of about 6 ft. 4 in. each, of No. 9 B.W.G. or 6·5 lbs. per foot super in thickness, riveted together by means of $\frac{5}{16}$ inch rivets, 1⅛ inch pitch—lead-painted tape being inserted between all rivet joints, so as to ensure the gas-tightness of the job.

After due consideration, it was determined that the guide-framing of the gasholder should be extended to the full height. Investigations and calculations showed that the metal would have to be employed in either one or other of the structures; and I preferred to put in the permanent guide-framing, by extending its length rather than by exposing the upper lift to the terrific storms that frequently visit the locality in which the holder is placed. So far as my investigations went, there did not appear to be any economy from a pounds, shillings, and pence point of view in reducing the height of the framing; the entire strain on the structure being still transmitted to, and supported by, the framing. The type of framing therefore that I determined upon had no superfluous metal in its composition, such as is found in some similar constructions, as will be seen by reference to the table accompanying this description.

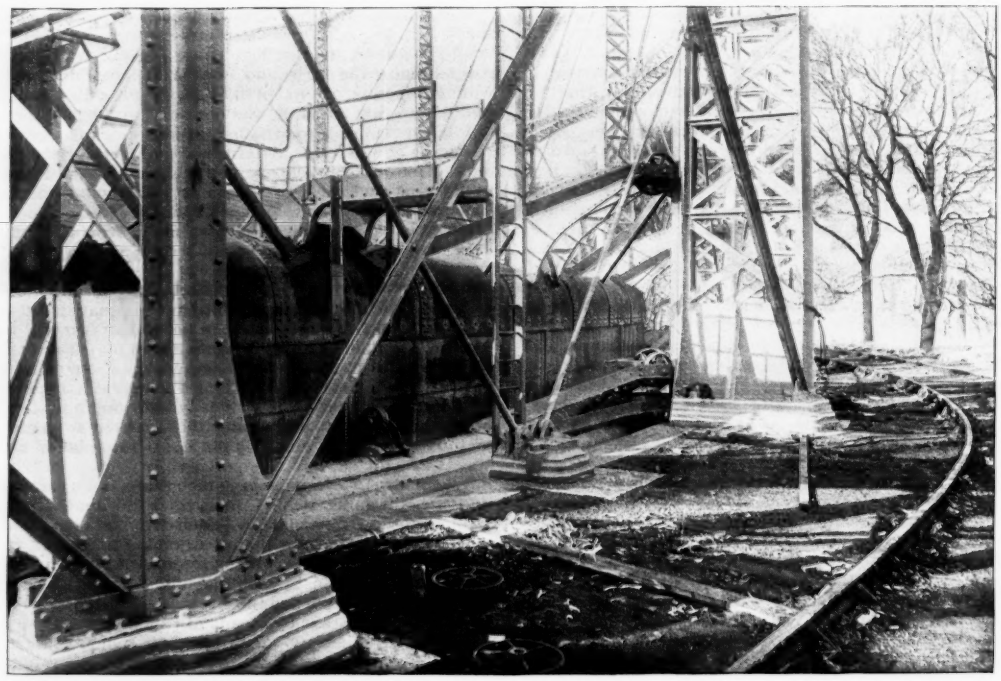
There are 26 standards, spaced around the tank at a distance of about 30 ft. 6in. apart on the face of tank. The section of the standard is shown in figs. 6 and 7. It consists of the following members: A splayed channel, with a 6-inch face ⅝ inch thick; the splayed sides being also 6 inches long by ⅜ inch thick. Riveted to this are two 3 inch by 6 inch by ⅜-inch splayed angles. A back plate is then provided, 1 ft. 8 in. wide by ½ inch thick, and two 3½ inch by 3½ inch by ½ inch angle steels, riveted through and through.

The back members consist of two 3½ inch by 3½ inch by ½ inch angle steels with a U section flange plate, ⅜ inch thick, riveted thereinto. The standards at the base are 6 feet wide from front to back, tapering to 2 ft. 8 in. wide at the top, where the top tier of girders is placed. Between the front and back members, at points about 4 feet apart, steel stiffeners are introduced, riveted to the flange of the angle steels by means of ¾ inch rivets, and to each other through the breadth of the standard with ¾ inch rivets and distance-pieces of 1 inch gas-tube threaded thereon. These stiffeners consist between the ground level and the first tier of longitudinal girders of double 5 inch by 2½ inch by ½ inch T steels; on the second tier, double 5 inch by 2½ inch by ⅜ inch T steels; on the third tier, 4½ inch by 2½ inch by ⅜ inch T steels; and on the fourth tier, double 3½ inch by 3½ inch by ½ inch angle steels.

Between each of these stiffeners, flat steel diagonals are riveted. Between the base and the first and second rows of longitudinal girders, they are 4 inch by ½ inch; between the second and third rows, 3½ inch by ½ inch; and the top section consists of 3 inch by ½ inch flats. The cross section of the standard may, therefore, be said to be a latticed box-girder.

There are four tiers of box-section girders encircling the framing, consisting of 3½ inch by 3½ inch by ¼ inch angle steel corners, and 3 inch by ½ inch flat diagonal bars, excepting the top row, which is provided on the top side with a $\frac{5}{16}$ inch chequer plate forming the platform round the framing.

The girders (as will be seen from Plate No. 26) are made to be continuous and complete rings encircling the framing; the angle-steels forming their corners being riveted to the back members of the standards, and the diagonal bracing being continued throughout the circumference, passing through the web of the standards. The junction-plate at the back of the standards is made to form the cover plate, as well as providing the attachment for the diagonal bracing.

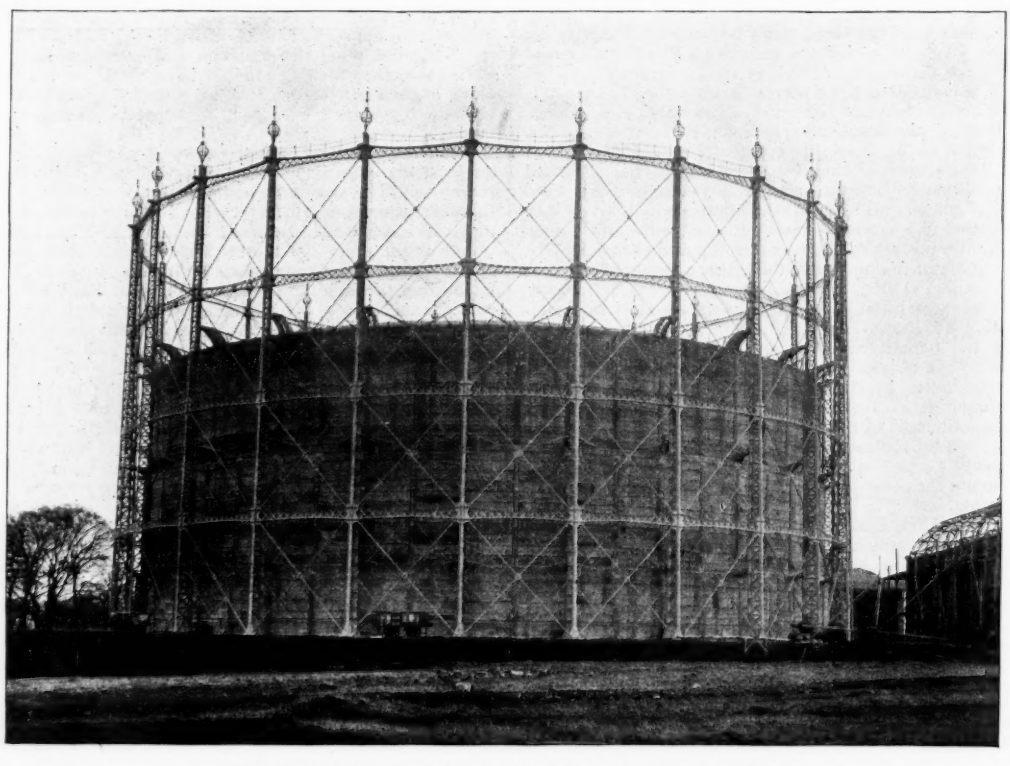


PHOTOGRAPH No. 133.—The first ascent of the gasholder, illustrating the subsidiary guide-carriages steadying the ascent.

The holder was originally designed for one set of diagonal bracing, placed at an angle of 45°, communicating from the base of the standard to the junction of the girders. These consisted of double T steels, placed back to back and riveted to a steel plate, and proportioned to the strains that would come upon them. On the first or lower tier, they were 5 inch by 3 inch by $\frac{9}{16}$ inch; on the second tier, 5 inch by $2\frac{1}{2}$ inch by $\frac{3}{8}$ inch; on the third tier, a single 5 inch by 3 inch by $\frac{1}{2}$ inch; and a single $4\frac{1}{2}$ inch by $2\frac{1}{2}$ inch by $\frac{5}{16}$ inch on the fourth tier.

Before the gasholder tank had proceeded far, a violent storm from the north-east prevailed. During the night it had broken down several scaffold poles that had been erected at the corners where the principal buildings were to be erected, and between which lines had been hung to indicate the general disposition of the buildings, in relation one with the other. Some of the poles were broken short off at a point 5 or 6 feet from the ground. This caused me to again go through the figures as to the strains upon, and the strength of, the gasholder framing.

I have always had a great repugnance to the employment of more metal in a structure than is absolutely necessary for the purpose it has to serve; and I was also conscious that the weight of our Granton framing was to be considerably less than many other gasholders of similar sizes that had been recently constructed (see table). My investigation showed that the weak part of our structure (if it has one) was the point between the different tiers of girders—about 34 feet of the body of the standard being free and without support. I therefore determined to introduce a supplementary set of diagonals, and to attach these to the back member of the standard at the central point midway between the girders. Then, in the event of a great storm, and the holder



PHOTOGRAPH No. 134.—General view of the gasholder as completed.

guide-rollers being midway between the girders (consequent upon the standards having to transmit the entire stress along their length to the points where the girders are attached), the supplementary set of bracing would act as the rods to this portion of the standard. I also determined that this set should be kept at the same angle as the original set, and that their base attachment should be at a point midway between the principal standards. The intermediate piers from the base to the cope being brought up to the full thickness of the base part of the wall and foundation bolts built in, in the intermediate piers, in the same way that the foundation bolts were built in, in the main piers, for fixing the bases of the vertical standards. This system of diagonal bracing was as near as possible of the same sectional area as was originally provided for, but in the form of round bars instead of tees or flats. It is lighter in appearance; and in the future we shall have gathered some experience as to the relative loss by corrosion on round and flat members exposed in a saline atmosphere.

With a maximum storage capacity of 6 millions, and an output of over 10 millions, it will be readily understood that my first endeavour was to get a gasholder and tank established at Granton and connected up to our existing system, although the manufacturing works there might not be in operation. As ill-luck would have it, this had to be done when steel work was at "boom" prices. As the future supply of our area, however, depended upon our getting the new holder to work at the earliest possible date, this had to be put up with. In stating the cost of the work, therefore, I think it important to give also the details as to the cost of raw material at that time.

It may be interesting to remark that the total floating weight of the gasholder is 995 tons, and cost at the rate of £19 10s. per ton. The total weight of the standards, diagonal bracing, finials, holding-down bolts, &c., &c., amounted to 875 tons, and cost at the rate of £11 per ton. The contract for the work was let on July 17, 1899, at which time the prices of raw material stood as follows in the open market, at per ton:—

Sheets	£9 0 0	Plates	£7 17 0
Flat bars	7 12 6	Angles	7 5 0
Tees	7 15 0	Joists	7 12 0
Round bars	8 0 0	Troughs	8 17 6
Cast steel	22 0 0	Castings	8 10 0

To compare the cost of this holder, therefore, with others, it is important to also take note of the cost of raw material at the time, together with a careful comparison of the schedule of quantities used in the construction of each.

For what it is worth, however, I give the figures as to the cost of this construction. It amounted to £40,161; this including the gasholder complete, together with the tank-guides, the inlet and outlet pipes and syphons, and the wood interior crown-framing. Adding this figure to the total sum for the cost of the tank, we arrive at a summation of a total of £8 9s. per 1000 cubic feet of maximum gasholder capacity for tank and holder combined; and £8 19s. 10d. per 1000 cubic feet of working capacity of gasholder—a figure which, when one bears in mind the high price of raw material at the time the work was done, compares very favourably with the best examples in the country.

After completing the designs for the gasholder, I compiled a comparative table setting forth the weights of materials employed in the construction of some of the most prominent gasholders that have been erected during recent years; and while I have, for obvious reasons, refrained from giving the names of the towns where the gasholders exist, I give their dimensions and weights from published records in most instances, but in some other instances the weights have been estimated from the published drawings relating thereto. From a perusal of this table, it is remarkable to see the enormous difference there is between the weights of the guide-framing of the gasholders approximating the same size. As many of the gasholders of the light weight, so far as their guide-framing is concerned, have been in existence for many years, and have stood the test of time, it is quite evident that others have been constructed with a margin of safety altogether beyond what is necessary for such structures.

The table is capable of considerable amplification; and there is no doubt some very valuable information could be compiled if this were done. One would anticipate that, as the holders decreased in size, the framing would become of necessity heavier in proportion; but a careful analysis on this basis would, I am inclined to believe, lead to very valuable information being acquired in this respect.

In conclusion, it is only necessary for me to add that Messrs. Clayton, Son, and Co., of Leeds, were successful in obtaining the contract for this work in open competition; and it is gratifying to be able to state that they have executed the designs in a most faithful manner, and have erected a piece of work which is of considerable credit to all who have had in any way to do with its construction.

Appendix.

Table *Showing Floating Weight and Weight of Guide-Framing per* 1000 *Cubic Feet of Working Capacity in Modern Gasholders by Various Designers.*

Date.	Weight of Framing per 1000 Cubic Feet Capacity.	Working Capacity *minus* Crown and Lap of Cups and Dips to Blowing Point.	Diameter of Outer Lift.	Number of Lifts.	Working Depth.	Floating Weight.	Floating Weight in Pounds per 1000 Cubic Feet Capacity.	Number of Standards.	Height of Standards.	Tiers of Girders.	Weight of Guide-Framing, including Bolts.
	Lbs.	Cubic Feet.	Ft. In.		Ft. In.	Tons Cwts. Qrs.			Ft. In.		Tons Cwt. Qrs. Lbs.
1901	264·82	6,574,730	250 0	4	138 8	1010 15 1	345·02	26	143 6	4	775 16 0 25(*a*)
1885	287·93	6,250,372	236 0	3	146 4	821 11 0	294·42	26	151 0	5	803 9 0 0
1888	275·19	3,679,126	204 0	3	116 4	513 0 0	312·33	22	122 0¾	3	452 0 0 0
1891	483·24	5,656,559	236 5	3	132 4	875 10 2	346·70	26	137 8	3	1220 1 3 22
1895	533·02	4,735,140	216 5	3	132 4	728 1 1	344·41	24	137 8	3	1126 15 0 0
1896	321·10	6,524,655	250 0	3	141 3½	1200 0 0	411·97	28	150 0	6	935 0 0 0
1898	249·39	8,379,984	261 0	4	160 8½	1220 0 0	326·11	..	..	..	933 0 0 0(*b*)
1901	486·24	5,469,971	236 0	3	129 4	992 4 0	406·31	26	135 6	6	1184 8 0 0(*c*)
	517·08	5,046,749	216 5	3	141 4	830 0 0	368·39	24	146 6	3	1165 0 0 0
	492·55	3,790,102	207 0	3	116 4	634 7 0	374·90	..	..	..	833 8 0 0

Remarks.—(*a*) Granton. (*b*) Guide-framing to three lifts. (*c*) Calculated from published statistics.

The Congress for Applied Chemistry.—In last week's number of the "Journal" there was an abstract of a paper read by Mr. George Beilby, at the recent International Congress for Applied Chemistry, on the position of the cyanide industry. In the same section, Dr. Lunge reviewed the state of the sulphuric acid manufacture in a very able paper, recommending water-sprays (not vapour) for the lead chambers, and reaction plate towers with artificial draught, and pointing to the great improvements lately effected in concentration apparatus. Synthetic cyanide processes were discussed, in different sections, by Herren F. Rössler, G. Erlwein, and A. Frank. The latter two spoke particularly on the Caro-Frank process taken up by Siemens and Halske. Herr J. Bueb, of Dessau, explained the system for the recovery of the cyanogen from illuminating gas. Some important communications on the self-purification of water were before the members of the Congress. Herr G. Weigelt, of Berlin, had experimented on the rates of diffusion of refuse waters into river courses when introduced in different circumstances; and he showed that tests based upon average contamination are quite misleading when injury to the fish is concerned. Herr F. Fischer, of Göttingen, spoke on technically pure water; and regretted that biological tests seemed to supplant chemical analysis. He said the methods of taking samples were faulty. Herr Vandevelde, of Ghent, remarked that rest, absence of antiseptic and chemical compounds, presence of living organisms, and aëration favoured the self-purification of water courses. It was resolved to bring the water question before the next congress.

Workshop Arithmetic.—Mr. C. T. Millis, Examiner in Metal Plate Work to the City and Guilds of London Institute, and Principal of the Education Department of the Borough Polytechnic Institute, has just compiled a book on "Technical Arithmetic and Geometry," which is intended both as an introductory course of mathematics for those who may not have the opportunity for further study (such as young men engaged in the engineering and building trades), and as a preparation for students in modern schools and technical institutes who will have opportunities of carrying on their studies to a more advanced stage. The course consists of arithmetic, geometry, and mensuration. At the end of the book there are some suggestions for a drawing-office and experimental course, which may be taken in connection with the foregoing subject-matter, so as to impress the important principles upon the mind of the student. There are also some notes on the metric system, which include tables of equivalents and some worked-out examples of the conversion of an imperial measure into the corresponding metric figure, and *vice versâ*. Mr. Millis has had nearly a quarter of a century's experience in the teaching of artisans connected with the engineering and building trades, as well as other students in technical institutes, on the lines laid down in his book, with the result that he is now more convinced than ever of the value of such a course of study. The price at which Messrs. Methuen are publishing the work is such as to bring it well within the reach of those for whom it is more especially intended; and we may predict a ready sale for this useful little manual.

PHOTOMETRY UP TO DATE.

THE attention of engineers and suppliers of gas will be directed henceforward with particular acuity to the subject of the photometrical rating of the article as sold for general purposes. It seems at the first blush almost superfluous to say this, in view of the conspicuous place always occupied in gas matters by the photometer; but it is nevertheless the truth, that recent events, culminating in the parliamentary proceedings on the Crystal Palace District Gas Bill, have not so much revived interest in this order of questions, as placed them upon a fresh basis. It is a fortunate circumstance that certain facts in relation to the ascertainment of what is called the illuminating power of ordinary lighting gas were brought out at the recent meeting of the Institution of Gas Engineers, which are useful as a means of testing the character of the proceedings in the case of the Crystal Palace District Gas Company. The previous discussion throws a much-needed light on the points of difference in the latter dispute. Otherwise, it might not be so easy to see what the parties to the parliamentary conflict were fighting about.

The position, therefore, is as follows: The fundamental law of gas testing for illuminating power is that this shall be done with the burner best suited to the purpose, used in the way most favourable for the gas, provided only that the burner itself shall be one which consumers can use if they please. Except to the wilfully blind, there cannot be the smallest mistake as to the intent of this enactment, which has been justly styled "the charter" of the illuminating gas industry. It contemplates and prescribes a burner of maximum efficiency, used so as not to impair this efficiency in any way; and the only qualification of this description of burner is that it must be an ordinary consumers', or commercial, article, not something of the merely philosophical instrument type—like (say) the Vernon-Harcourt pentane standard of light. The most efficient burner known for developing the luminous quality of gas, without any addition or advantage of any kind, must be selected with regard to the character of the gas. For oil gas or cannel gas, a flat-flame burner is the most suitable, by reason of the high carbon density of the combustible, which requires the freest possible exposure of the flame to air in order to burn properly without smoking. Obviously, the best make and size of such burner is the proper one for use for this purpose; and there is no question about the suitability of any flat-flame burner for consumers' use. For gas of less carbon density, requiring to be shielded from excess of air if it is to develop the utmost lighting value of which it is capable, the argand type of burner, with chimney, is best adapted. These are bottom facts, from which there is no getting away by any photometrist. Experience has taught that the line of demarcation, where it is immaterial whether the gas is burnt by a flat-flame or by an argand burner, because it will yield as much light per cubic foot from one burner as from the other (assuming these to be equally good and capable of an equal and reasonable rate of burning), is at about 17 candles for a consumption of 5 cubic feet per hour. This line of demarcation is not a mathematical one, having no width. On the contrary, it is a rather thick stripe, covering a width on the candle scale of from a candle to a candle and a half—that is to say, from about 16½ to 18 candle gas.

Well, now, so far all is plain dealing. The flat-flame burner (assuming it is a good and proper one) cannot be used improperly in a photometrical instrument, unless with intent to deceive. One cannot be sure, however, that a case could not be advocated for taking the mean of the lighting effect observed at all angles of presentation of the flame to the photometer disc as the correct illuminating power—if the worst aspect of all were not selected as the measure, on the ground that the consumer must be exposed to this effect as frequently as to another! The conditions of use are very greatly different, however, with the argand burner. While, like the flat-flame burner, there are good and bad makes and patterns of argands, it is the weakness of the latter that they are susceptible of being misused. It needs a degree of misdirected ingenuity and perversion of ideas to do this; but it has been forthcoming. A standard argand burner, such as the ordinary consumer could use, has been adopted and legalized for the testing of English gas supplies of below 17-candle power, where no other description of burner is prescribed by Special Act. This exception is of great practical importance, as will shortly appear. With the standard burner went, by common consent, a standard rate of burning the gas; and the statutory illuminating power was the observed result of this combination.

There was no unfairness whatever in this arrangement, so long as its object and application were generally accepted and understood. It was a test for 16-candle gas—that is to say, it corresponded to a quality of gas which yielded a light equal to that of 16 candles in the standard burner, when consumed at the rate of 5 cubic feet per hour. This was standard common gas. In London and some other towns where the best means existed of working to the standard, a deficiency of more than half-a-candle was penalized. For the Provinces, which were brought under a General Act which must have been in preparation at the time this standardizing was effected for the Metropolis (1868-71), the same rule exactly was adopted, with the difference that a larger margin was allowed before the deficiency became punishable, and there was no neutral zone of a half-candle. Our point here is, that the intention of the Legislature was that all the ordinary coal gas sold in the United Kingdom should be of one and the same quality.

Although a 14-candle test was very generally allowed—raised some years later to 15 candles by the Board of Trade—the gas could not satisfy this test, as prescribed by the Gas-Works Clauses Act, 1871, unless it was really of approximately the standard quality recognized for London as 16 candles. Common practical experience confirms this interpretation of the condition. Provincial gas undertakings supposed to be making 14-candle gas were compelled to enrich the output from Durham coal, just as if they had been working to the 16-candle standard—that is to say, 14-candle gas was not a standard quality, but a photometrical expression used with reference to the incurring of penalties for deficiency under the law.

The above observation applies to such English gas undertakings as are under the Act of 1871. Some of them have special test burners prescribed by their Private Acts; and this gave a superior degree of liberty of which some took full and legitimate advantage. This accounts for the origin of the "Wandsworth," and "Brentford" test burners, of which so much is heard nowadays. The Wandsworth Act, for example, simply prescribes a 15-hole argand test burner, which was a very familiar article half-a-century ago. It has to be used for gas burning at the rate of 5 cubic feet per hour. The practical result has been, that the newer test burner was made experimentally on the premises, so to speak, to obtain the best effect possible from the ordinary output of Wandsworth gas, burnt at the prescribed rate with a 15-hole argand. This, it is reasonable to aver, is therefore a true 14-candle gas standard. It may not be the best possible to be made. Neither a burning rate of 5 cubic feet per hour, nor a 15-hole burner, may be the highest achievement of the burner-maker's craft; but, given the two conditions named, the burner is as good an appliance as could be expected. It is a regular consumers' burner. Specimens hitherto made still have the extra gallery for carrying the "saucer" shade at the bottom, as used when the burners are fitted to reading desks, &c. Those undertakings which employ this or some similar test burner, as the "Brentford" (which is very like it, but not quite identical in construction), do really and truly work to a 14-candle standard; and what they supply is properly called 14-candle gas.

Outside these exceptional cases, and before the South Metropolitan Act of 1900 established the quality for this undertaking, 14-candle gas did not exist in this country. The South Metropolitan Company proposed to make it—not as a photometrical expression, but as a regularly manufactured article for sale. This involved a definition; and it is the terms of the suggested definition that have aroused the fiercest opposition of which pedantic photometric "science," as represented by the Metropolitan Gas Referees, is capable. This body flatly refuse to accept the spirit of the "charter" of the gas industry already stated, and, instead of giving 14-candle gas its due, they insist upon treating it as 16-candle gas that has gone wrong. In this peculiar attitude towards 14-candle coal gas, the Referees are, of course, supported by the London County Council.

The particular definition of 14-candle gas adopted by the South Metropolitan Company lends itself to this mistake. It proposes the continued use, as the test burner, of the standard "London" argand, with the difference due to the altered purpose. Instead of detecting a deficiency of illuminating power in what should be standard 16-candle gas, it is to show that standard 14-candle gas is of full quality. This is proved by the exact realization of the numerical ratio of the calculated consumption of gas by the burner to give its standard lighting effect of 16 candles—as 14 : 16, so is 5 : 5·71. Therefore, 14-candle gas, measured by the "London" argand No. 1, is, by the definition, that gas which yields the standard 16-candle power light for a consumption after the rate of 5·71 cubic feet per hour. *Q. E. D.* Only, the Referees cannot, or will not, accept the demonstration. They should be challenged for their definition of 14-candle gas—having regard to the consideration that what is in question is not a bad 16-candle gas, but a perfectly good article of its grade, and such as the consumer has a right to expect at the price he is charged for it.

The London County Council appear to be more concerned with the nominal increase of quantity required to be consumed to produce the same effect with 14 as can be obtained from 16 candle gas. Let us hasten to remark that this is a perfectly proper solicitude on the part of any guardian of the interests of the public. In the course of the proceedings on the Crystal Palace District Gas Bill, the following passage occurs, in the cross-examination of Sir George Livesey by Mr. Freeman, K.C.: (Q. 216.) "I have already asked you about what you say, that the consumer will have to burn more with 13-candle gas, and you say he will not have to burn any more?—Not in practice. (Q. 217.) Although in theory he ought to?—Yes, in theory he ought to." Obviously, if the phenomena of the photometer-room were carried out in the district, this would be so, in the proportion of any reduction of illuminating power, or calorific effect, or whatever else may be the standard of value—always assuming that the practices of the district fall short of the records of the testing-station. In point of fact, however, the ability to realize from sevenfold to tenfold the nominal lighting effect recognized in the photometer-room is an advantage the consumer has over the photometrist, which ought to go to the chastening of the latter functionary.

Circumstances have wholly changed since the returns from

the photometer-room indicated results to which the ordinary consumer could scarcely attain, unless he burnt his gas under similar conditions of cloistered quiet—which clearly he might do, if favourably situated. Now, the corner publican laughs at the professor who fails to see any advantage in incandescent gas lighting. Still, it is undeniable that the lower the grade of the gas, as rated in illuminating power, the worse figure it makes in ordinary flat-flame burners. This result follows from what has already been remarked in the choice of test burners. From a 16⅔-candle gas downwards, the lighting duty of flat-flame burners falls off much quicker than the argand duty. To a degree, this can be easily corrected by the employment of good and suitable burners for bad ones. The ordinary kinds of flat-flame burners in use in any district are far worse than anything that could result from the intelligent use of the lowest-grade gas ever sold for illuminating purposes. Much can be done to correct this defect of ignorance and carelessness. Eventually, no doubt, throughout England a similar state of affairs to that actually prevailing in Germany will be reached, in which the use of the flat-flame burner is confined to draughty passages, lavatories, and places where the "showing of a light" is the essential, and the lighting effect is unimportant.

After all, the conclusion remains that an illuminating gas must be self-luminous. The precise degree of this luminosity is but a detail. It may be granted, without difficulty, that if it had not been for the incandescent burner, and the happy discovery that calorific value does not necessarily go with nominal illuminating-power, the movement in favour of low-grade gas could not have been started. It would be waste of time to blame the London County Council for laying stress on the truth that this movement is not to the sole benefit of the user of flat-flame burners. The only pertinent questions arising from this truth of observation are: To what extent is the flat-flame burner user to be respected? Is he to dominate the position, and block all progress in which he is incapable of participating? Has he used his ancient privilege so thoroughly that he is entitled to the first and last consideration? As a matter of fact, by merely giving him better burners, the theoretical increase of gas consumption already signalized can usually be turned into a positive gain. This is the governing factor of the situation, which pedants fail to see, but men of business are quite able to appreciate. One thinks of calculated rates, and the other of cash out of pocket. The distinction is fundamental.

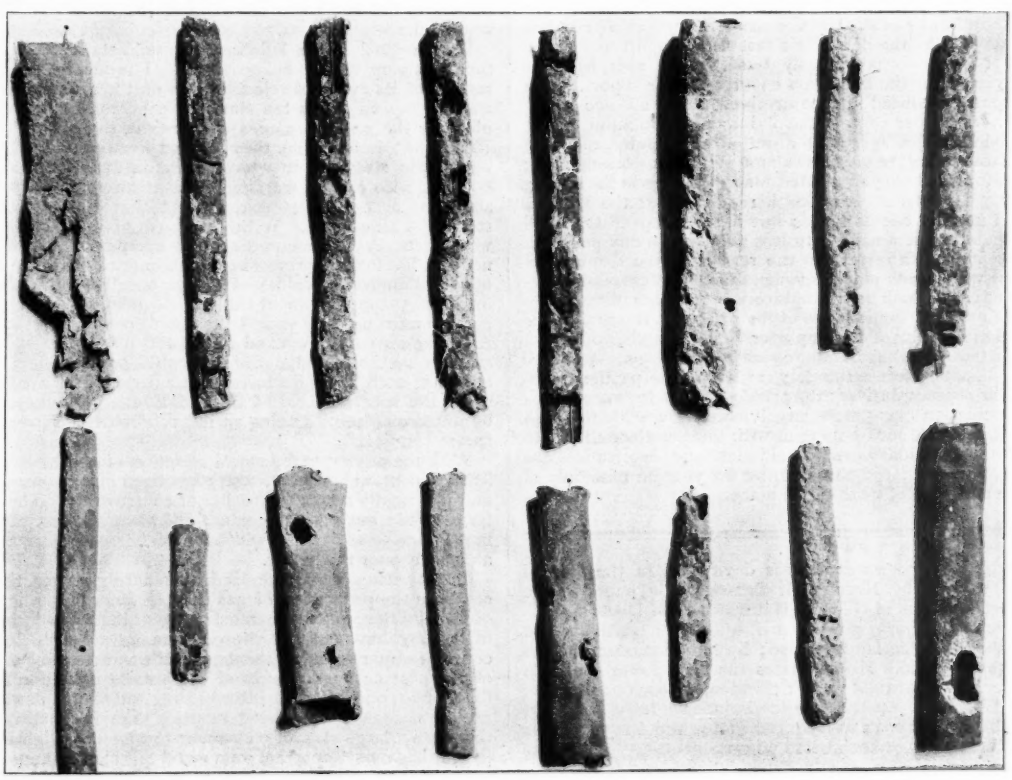
ELECTROLYTIC ACTION ON GAS-PIPES.

In the last and present issues of the "Journal," the above subject has once more come into prominence in connection with the Bill promoted by the Brighton Corporation to enable them to extend the present tramway system, and with that of the Beckenham Urban District Council to construct and work tramways. The results of the endeavours of the local Gas Companies to obtain protection for their pipes against electrolytic action, are noticed elsewhere; and all we purpose doing now is to present further evidence that such protection is needed.

During the proceedings on the Brighton Bill, reference was made to the case of fusion of a 2-inch pipe at Darwen illustrated in the "Journal" for the 23rd ult. (p. 906). By a coincidence, the same number contained a translation of M. Bouvier's paper at the last meeting of the Société Technique, giving an account of a gas explosion at Lyons caused by electricity. As all instances of damage to pipes tend to strengthen the case of the gas companies in their applications for the imposition upon suppliers of electricity of more stringent protective measures than those furnished by the Board of Trade regulations, we give a reproduction of a photograph of a group of pipes collected by Mr. Henry Green, the Engineer and Secretary of the Preston Gas Company, who was one of the witnesses called on behalf of the opponents of the Beckenham Bill. The pieces of pipe shown were originally selected for submission to the Committee of the House of Lords on the Preston and Horwich Tramways Bill earlier in the session; but, as reported in our columns at the time, the promoters agreed to a clause which fully satisfied the Company. See "Journal" for the 9th ult. (p. 684).

Mr. Green had a very good case to lay before the Committee; and he was prepared to back it up with his specimens of electrolyzed pipes. In the first place, his mains would be crossed about twenty times by the tramrails, and as some of them would be in close proximity thereto, he considered it essential that either the mains should be removed, at the promoters' expense, to such distance as would, in future repairs, place the workmen beyond danger, or that the promoters should furnish such skilled assistance as might be deemed necessary for the regulation of the traffic during the carrying out of such repairs. As there was every probability that the Company would be sufferers from electrolysis, they thought the promoters should be made liable not only for any damage caused directly to their property, but for injury or inconvenience consequent upon such damage. He was prepared to submit to the Committee that it would be manifestly unjust that the Company should be held responsible for injury caused by an escape of gas arising from damage caused to the mains by the promoters' operations. The smaller service-pipes of the Company have for many years been of lead; and before the introduction of electric lighting in Preston no trouble was experienced in regard to them. In 1893, however, soon after the Electric Supply Company began to send out current, considerable damage was done to the pipes by fusion arising therefrom. The injury became so serious, that the Company were compelled to appeal to the Board of Trade, who instituted an inquiry, and a report was made on the subject by their Inspector.

Things went on pretty well until last year, when the workmen found they had frequently to attend to escapes of gas arising from what appeared to be corroded pipes. These, however, were not specially brought under Mr. Green's notice until pipes which had been relaid only a few months previously were found to be again destroyed. This satisfied him that the damage did not arise from ordinary causes; and he submitted samples of a



dozen or fifteen pieces taken out of different services, together with some of the earth from around the pipes, to eminent electrical and chemical experts, who were clearly of opinion that the damage was caused by electrolytic action.

The pipes shown in the photograph were mostly relaid between March 2 and July 18, 1902. In one case, the pipe had been taken out and another substituted in June, 1899, and the second pipe had to be renewed in April, 1902. In another, a service relaid on May 25, 1902, had to be renewed on July 2, 1902, after having been only 38 days in the ground. In this case, the water-pipes also had to be relaid; and in another they were melted. All the samples shown were taken from different parts of the town; and in some instances the earth surrounding them was quite warm. The photograph tells its own tale better than could be done by verbal description.

TRADE QUESTIONS IN THE PAST YEAR.

We have received from the Deputy Controller-General of the Labour Department of the Board of Trade (Mr. H. Llewellyn Smith) two reports recently issued by his Department, dealing respectively with the changes in the rates of wages and hours of labour, and the strikes and lock-outs in the United Kingdom during the year 1902.

With regard to the former report, Mr. Smith says the principal feature of the changes which occurred during the year was the fall in wages in the coal-mining industry; the reductions in this industry accounting for 95 per cent. of the total decrease recorded. In the industries for which it is possible to obtain definite statistics with regard to the number of persons affected, the report shows that about 890,000 workpeople had their wages changed during 1902—a number which represents approximately 11 per cent. of the total working population covered by the statistics. Of this total, nearly 92,000 received advances during the year amounting to £5300 per week, or an average of 1s. 2d. per head; while 793,000 sustained decreases amounting to about £78,000 per week, or an average reduction of about 2s. per head. The net result of all the changes was thus a decrease of £72,700 in weekly wages. This compares with a decrease of £77,300 in 1901, and an increase of £209,400 in 1900. Taking into account the various dates at which the alterations in 1902 came into operation, the net decrease in the year's wages bill, due to the changes recorded in the report, may be roughly estimated at £2,300,000, compared with a decrease of £1,600,000 in 1901 and an increase of £6,000,000 in 1900. As far as the gas industry is concerned, there was no change in rates of wages of companies' employees. Those in the Leeds Gas-Works obtained in June an advance of 2d. per shift—the change affecting 820 men; and at Merthyr Tydfil and Pontypridd the gas stokers had their hours reduced to 56 per week.

With regard to the strikes and lock-outs, Mr. Smith reports that, on the whole, the year 1902 was less affected by labour disputes than its predecessor. The total number of stoppages was comparatively small, and, though a larger number of persons were concerned than in any of the last five years, the aggregate number of working days lost—the best single test of the importance of the disputes of the year—was not only less than in 1901, but was below the average for the five years covered by the report. The 442 new disputes recorded in 1902 involved about 260,000 workpeople, or about 2·9 per cent. of the industrial population of the United Kingdom. The aggregate duration of disputes, new and old, in progress during the year was about $3\frac{1}{2}$ million working days; nearly three-fourths being accounted for by disputes in the mining and quarrying industries. Mr. Smith remarks that the amount of working time lost seems large; but if spread over the total working population, it amounts to less than half a day per head during the year. With respect to the results of the disputes of 1902, if those which took place between different classes of workpeople (disputes in which their employers were only indirectly interested) are omitted, the balance of the results of the remainder was distinctly in favour of the employers. The number of actual stoppages settled by arbitration or conciliation was 29. As usual, most of the disputes were ultimately settled by the parties themselves or their representatives; the principal agencies for arbitration and conciliation being more largely concerned with the prevention of strikes and lock-outs than with their settlement. The various permanent Boards of Conciliation and Arbitration are known to have settled 678 cases during the year, in nine only of which had a stoppage of work taken place.

An estimate of the water powers developed in the several countries was given by Herr A. Gradenwitz, in a paper before the Frankfort Congress of German Naturalists and Doctors. His figures (representing horse powers) are as follows: Germany and Austria, 180,000; Switzerland, 160,000; Sweden, 200,000; and the United States, 400,000. He estimates the total power available in a number of countries to be: Sweden, 2,000,000; France, 10,000,000; Germany, Austria, Switzerland, and Italy, together, about 10,000,000; while in the United States the Niagara Falls alone could furnish 10,000,000-horse power.

COMMUNICATED ARTICLE.

GAS AND GAS TESTING.

By H. Leicester Greville, F.I.C., F.C.S.

"*Tempora mutantur!*" The various papers, of which the context was recently published in the "Journal," and the amount of discussion raised, prove—if any demonstration was necessary—the vast interest taken at the present time in the subject of gas testing in its widest sense of photometrical and calorific value. The issues involved are so great that a few remarks from myself may not be inadmissible. What with the portable photometer, Sunday testing, and unlimited licence to the gas examiner to test the gas supply at any hour of the day, it would perhaps be forgivable for a harassed gas company, in the absence of a possible use of explicit but unconventional language, to find a substitute in Scripture, and to quote the well-known text, "Why do the Heathen so furiously rage and the people imagine a vain thing."

Prior to offering a few comments on the recent papers and discussions, it may perhaps be of interest, as an old Gas Examiner, to compare briefly the new *régime* with the old under the jurisdiction of the Metropolitan Board of Works. With the so-called standard candle as a basis, tests were made at such periods of the day as were supposed to represent the maximum consumption for lighting purposes—at eight, nine, and ten o'clock p.m. during the summer months, and six, seven, and eight p.m. in the winter months. Curiously enough, these were the days before the extensive use of gas for heating and motive power purposes. Now that we have in many cases about 50 per cent. of the gas supplied used for purposes other than illumination, and with the birth and progress of the incandescent burner, gas companies are faced with a more stringent method of testing the light of the gas they supply than they have ever had in the old days.

Everything has changed. The gas examiner of yore was obliged to sacrifice his evenings to his work—at a salary of £100 per annum. The gas examiner of to-day has a largely increased remuneration, and can take his tests at any time to suit his own personal convenience and to fit in with the exigencies of his other professional work. In addition to this, photometrical work with the table photometer and the ten-candle pentane standard is an absolute luxury in scientific work as compared with the older system of candles and the closed Evans photometer. The amount of work which was done in connection with the change of standard between the old candles and the modern method, no one can know except those who have been through the ordeal, like myself, as an investigator in connection with the Standards of Light Commission. All sorts and kinds of candles had to be tested. Mr. Vernon Harcourt's one-candle standard, for which air charged with pentane, and prepared under the most carefully prepared conditions, had to be employed. A double flame, representing two candles, was also used. Then followed sundry ten-candle standards—Vernon Harcourt, Sugg, and Dibdin—all more or less founded on carburetted gas, with a screen in which the top of the flame was cut off and the lower part of the flame was used.

With regard to the Dibdin ten-candle standard, which at one time was very nearly being adopted, I remember that the main reason of its eventual rejection was on the ground that the light was not equivalent to ten standard candles, such as were recognized by the gas companies at the time the respective Acts of Parliament under which they worked were passed. The present ten-candle standard, in which pentanized air is used, is, in my opinion, with careful working, as near an approach to an ideal standard as could be desired; and that opinion is, I believe, shared by all experts. With the advent of the 10-candle, together with accuracy of construction and comparative ease of adjustment, it has two other most important merits—viz., the constancy, (*quoad* illuminating value) of the carburetting material, and the unvarying composition of the vehicle (air), the supply of which is automatic, used for vaporizing it and conveying it to the burner. All those who have worked under the old *régime* welcomed the modern method; and nothing I could possibly imagine would occasion such absolute terror as to perceive in a dimly-lighted room the spectral form of the old Evans photometer attended by numerous feebly shining sprites representing shades of extinct sperm candles.

With the advent and general adoption of a reliable standard of light, that branch of photometry has been placed on a sound basis and practically out of the region of controversy. The arena is so far cleared; but other important questions are now taking a foremost place—ones which will have to be settled sooner or later, and the sooner the better.

The lowering of the standard illuminating power, the large increase in the proportion of gas used for purposes other than that of illumination, and the extensive use of the incandescent system of lighting, have entirely altered the conditions which have to be considered in regulating the manufacture and testing of gas. One of the most curious features of the present condition of things is that, while consumers of gas for heating and motive power purposes are possibly more interested in price than in illuminating value, there are a large class of consumers to whom the lighting value of the gas is a most important item; and this class cannot be ignored

in considering the quality of the gas supply. I speak more especially of those who still use the older class of burners—such as fishtails or batswings. But this class will no doubt be a diminishing quantity with the steady reduction in price of burners and mantles for incandescent lighting. Further, with regard to the prosperity of gas companies who always look year by year for an increased sale, the demand for heating and motive power purposes is increasing; but on a basis of incandescent lighting, the amount employed for actual illumination must be decreasing.

Notwithstanding the well-known fact that a material drop in the illuminating power is not accompanied by a corresponding decrease in calorific value, I am of opinion that, at all events at present and in the immediate future, there must be a limit to the present tendency to lower the standard illuminating power. At present, opinions seem to be in conflict with regard to the testing of gas of an illuminating power of materially less than 16 candles; the principal points raised being, what description of burner should be used, and what should be the gas consumption. This involves the question as to what is attached to the terms 16, 14, or 13 candle gas. Some time back, I wrote the following in an article published in the "JOURNAL":* "What is the true illuminating power of any particular gas? This is a question which not even the most expert scientist can answer. All we know is that a gas tested under certain conditions develops a certain light, which might vary under other conditions."

This is really the *crux* of the whole matter. On the introduction of the Sugg "London" argand for 16-candle gas, when accepted by Act of Parliament, it was supposed to be suitable for the consumer, and subsequent proposed standards are also of the argand type. I do not consider argand burners are suitable for general use, although the most convenient for testing purposes. The mere necessity of the use of a chimney, with its concomitant of constant cleaning and liability to breakage, is a considerable disadvantage. In the necessary use of fishtails and batswings, the consumer is, apart from the light developed not being equal to the argand, at an additional disadvantage—viz., that a flat-flame does not give an equal light in all directions, the maximum being from the flat of the flame and the minimum from its edge. It would be useful to know whether the figures given by Mr. Grafton are from the flat of the flame only, or a mean of different positions? The question is a most important one.

With respect to the test-burner, it should certainly be one to give a fair value to the gas, taking into consideration that the consumer can obtain any proportion of light from his gas between 1·5 and 25 candles per cubic foot, according to the method of combustion. The standard burner should also be of an argand type. If it fulfils these conditions, and the burner and method of testing are sanctioned by Act of Parliament, there need be little subsequent controversy. Mr. Abady expresses a correct view when he said (in the discussion on Dr. Rideal's paper): "His conception of the object of testing gas at all was that it was the basis of agreement between a particular company and the public, obtained through the medium of a Parliamentary Committee." At the same time, it would certainly be advisable at present to use a 14-candle standard burner, for gases of nominal 14 or 13 candle power, in place of the "London" argand, which, made for 16-candle gas, must obviously have an excessive air supply for gases of markedly inferior illuminating power. A certain modification of air supply is attained by the Gas Referees' prescription as to burning the gas up to a 16-candle standard. In the abandonment of the rigid 5-foot rate of consumption (Professor Lewes aptly termed this rigid 5 feet consumption as "the demon of the play") there has been a distinct advance made; but it is questionable whether this alone suffices for low quality gas.

Whether the 16-candle standard is used for 16-candle gas or the 14-candle standard for gas the light of which is a little under or over, by far the fairest practical method is to burn up to a 16-candle flame. On the question of the practical value of gas to the public, some stress has been laid upon the detail of pressure. Mr. Grafton obtained his best results per cubic foot on flat-flame burners at increased pressures; but this simply proves that the respective burners were doing their best at the increased consumptions. My experience with flat-flame burners is that they develop the maximum amount of light when the gas is consumed through comparatively large holes or wide slots. I remember more especially some experiments with ordinary Bray fish-tail burners. Taking a No. 5 at 5 cubic feet, and while maintaining the same consumption use (say) a No. 8, the increase in light is most marked.

Dr. Rideal was so emphatic on the pressure question, that he commences his notes by the statement that "the economic value of a gas supply depends upon its pressure and its suitability for private or public use." The necessity imposed on the companies is *not less* than 6-10ths or 10-10ths, according to the time of supply. The pressure could easily be augmented, as at the outlet of the holder the pressure is very much greater, but is controlled by the station governor. The only difficulty would be the increase on the leakage account.

Professor Lewes's able lecture on "Candles and Calories" suggests a possibility of a definite relation between the illuminating value of a gas and its heating capacity; but it is questionable whether this could take such a practical form as to form a basis of legislation. Pure coal gas from different classes of coal varies in calorimetric value, and a further variation arises in many cases from admixture with water gas. Still, there is no doubt that calorimetry may in the future become a part of public gas testing, and is likely to prove of immense value. In fact, if lighting was universally effected by incandescent burners, and with the then possibility of materially cheapening the price of gas, and thus putting an impetus on its increased use for heating and motive power purposes, calorimetry would be more important than photometry. When we get a drop in lighting power from 16 to 14 and 13 candles, and an abolition of sulphur restrictions, circumstances seem steadily drifting to increased prosperity to gas companies, and cheaper gas to consumers. At the present time, the determination of illuminating power is the main issue. This need not be long a debatable matter, with a reliable standard of light, and a fixed definition in each Company's Act as to method of testing, burner to be used, height of chimney, rate of consumption, &c. In fixing a standard burner, it should however never be forgotten that, in cases where the illuminating value is derived from a large proportion of water gas, less air supply is necessary to develop the best light, than would be neceesary in the case of coal gas only.

Before concluding, I have one suggestion to make with regard to official testing. As the determination of the proportion of sulphur and ammonia in gas is made by a method which practically represents a mean of the day's supply, and the sulphuretted hydrogen test is on the same basis, why should not a similar principle be extended to the question of lighting power? It should not be a difficult question of mechanism, by means of a delicate governor and clock connected to an experimental meter, to deliver an even proportion of gas per hour into a standard holder. With suitable precautions, the average quality of the gas supplied during the whole day could be then reliably and expeditiously determined.

* See "JOURNAL," Vol. LXXX., p. 486.

Sir William Abney, K.C.B., &c., has been elected Chairman of the Council of the Society of Arts for the ensuing year, in succession to Sir William Preece.

It has been rumoured in parliamentary circles that Mr. J. H. Balfour-Browne, K.C., is offering his services to Dumfriesshire Unionists as their candidate at the next election, in succession to Mr. W. J. H. Maxwell, the present member, who has intimated that he will not again stand. Mr. Balfour-Browne is a native of the county, and he is sure to receive hearty support.

No less than five gas-engines on the Delamare-Debouteville system have been installed at the works of MM. de Wendel et Cie., Hayingen, Lorraine, to utilize the waste gases of the blast-furnaces. Two of the engines are of 1200-horse power each, and are intended for electric lighting and power purposes; while three, each of 600-horse power will be used as blowing engines.

Mr. J. W. Helps, the Engineer and General Manager of the Croydon Gas Company, who last November was elected, in the face of great opposition, a member of the Croydon County Council, has just received another token of the appreciation in which his abilities and public services are held—having been appointed by his colleagues on the Council a member of the Education Committee which has just been formed to take charge of the educational affairs of the borough. Mr. Helps received 42 votes—one less than the maximum recorded for any candidate, and more than twice the number given for the other candidates from the ward he represents.

According to a Blue-Book on "Mines and Quarries" recently issued, the total number of persons employed in and about all the mines of the United Kingdom last year was 855,603, of whom 824,791 worked at the 3349 mines under the Coal Mines Act, and 30,812 at the 703 mines under the Metalliferous Mines Act. Compared with 1901, there is an increase of 18,056 persons at the mines under the former Act, and a decrease of 1631 persons at those under the Metalliferous Mines Act. The total output of minerals at the mines under the Coal Mines Act was 239,717,699 tons, of which 227,084,871 tons were coal, 3,013,095 tons fire-clay, 7,214,310 tons ironstone, 2,107,534 tons oil shale, and 297,889 tons sundry minerals. With 10,171 tons from open quarries, the total output of coal was 227,095,042 tons—an increase of 8,048,097 tons on that of the previous year.

The Royal Society has just received from an anonymous source a donation of £1000 towards the fund of £12,000 which is being raised to enable the Society, without further expenditure of its own resources, to complete the catalogue of the scientific papers of the last century, upon which it has been engaged for so many years and has expended so much money, so as to link it with the International Catalogue of the Scientific Literature of the present century. Reference to this matter has already been made in our columns. It may be remembered that the fund was started by a munificent donation of £6000 from Dr. Ludwig Mond, F.R.S., which was followed by one of £1000 from Mr. Andrew Carnegie. A contribution of £367 10s. has since come to hand from "F.R.G.S.," and others of various amounts from Fellows of the Royal Society. The total amount already received or promised is £8636.

TECHNICAL RECORD.

AN AMERICAN ARRANGEMENT OF VERTICAL RETORT.

In our correspondence columns to-day will be found a letter from Mr. F. Egner, called forth by the recent publication in the "JOURNAL" of particulars as to the construction and working of the Settle-Padfield and Bueb vertical arrangements of retorts at Exeter and Berlin respectively. As a good American, Mr. Egner does not like the earlier efforts of one of his countrymen to be overlooked; and seeing that our pages did not at the time contain any illustrated account of the invention to which he directs attention, we take the opportunity of publishing below some particulars of this more than twenty years old proposal.

It was on Nov. 19, 1880, that Mr. Charles Francis Dieterich, of Baltimore, made application for a patent for "Improvements in Gas-Making Apparatus," filing a complete specification of his invention accompanied by two sheets of detail drawings, reproductions of some of which are given herewith.

In carrying out the invention, the patentee proposed to employ a vertical retort (or series of retorts) made in horizontal sections, so as to form, practically, so many distilling chambers with lateral

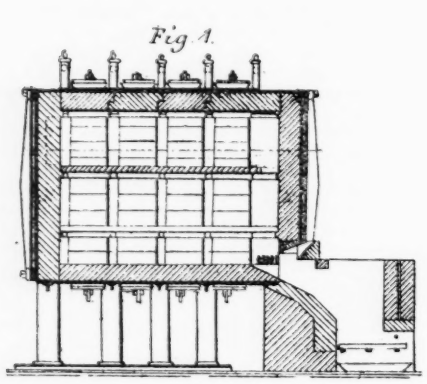


Fig. 1.

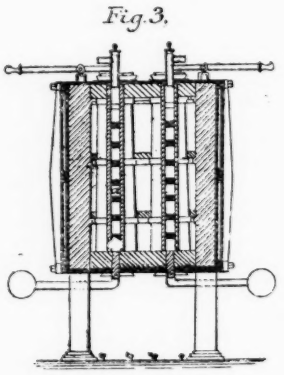


Fig. 3.

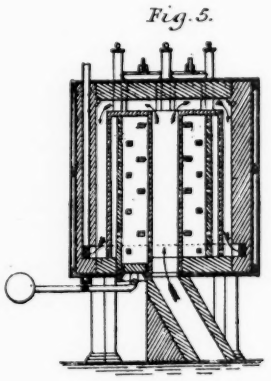


Fig. 5.

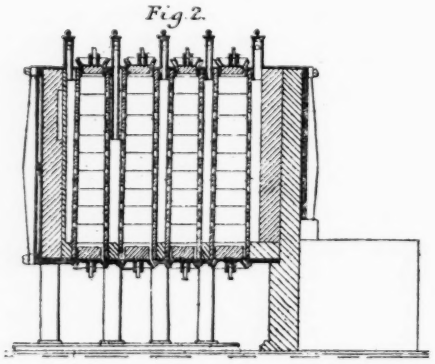


Fig. 2.

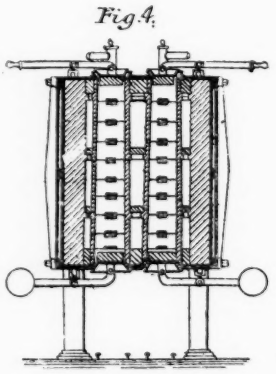


Fig. 4.

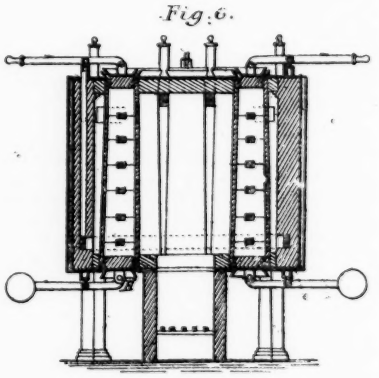


Fig. 6.

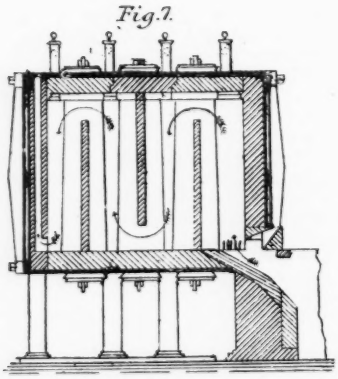


Fig. 7.

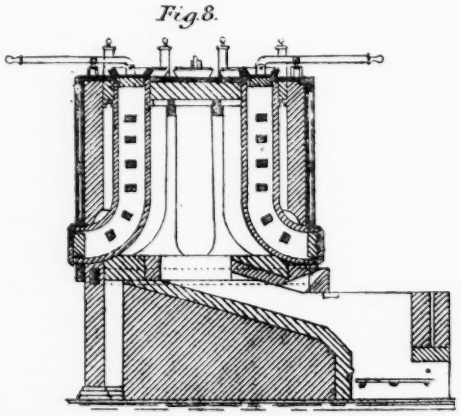


Fig. 8.

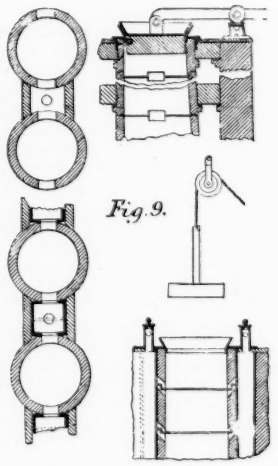


Fig. 9.

openings at their joints through which the gas as produced passed into a channel communicating with the stand-pipe without going necessarily through a heated mass above it. Hinged stoppers were provided at the top and bottom of the retorts; those at the top for charging the coal, and those at the bottom for discharging the coke. The retorts thus constructed were to be placed within a chamber having heat-retaining walls, through which chamber the heat and products of combustion from a furnace made their way by a circuitous passage to the chimney. The whole structure was supported on columns or piers high enough for barrows or trucks to pass under to receive the coke when discharged from the retorts, and having a railway above from which the retorts were charged.

The invention claimed to consist: First, in combining in a gas-making apparatus a vertical retort or series of retorts having lateral openings at different heights for the escape of gas, uniting with channels leading to the stand-pipes, and a heat-retaining chamber communicating with the furnace and divided by partitions into a series of sub-chambers, whereby the products of combustion were caused to take a circuitous passage around or about the retort or retorts to the chimney. Secondly, in constructing the retort in horizontal sections, the opposing edges of which were notched so as to form lateral openings in the retort when its various sections were placed in their proper relative positions.

The first suggested form of retort is shown in figs. 1, 2, 3, 4—longitudinal and transverse sections of a bed of eight retorts arranged as described. They were to be supported upon columns at such distance from the ground as would admit of coke barrows or

cars being taken underneath. The lateral openings before alluded to were to be made in the retorts in any suitable manner; but the method preferred was to notch the opposing ends of the sections and oppose the notches as the sections were placed in position. The channels into which the gases from the retorts found their way were to be constructed of brickwork and lined with iron. When channels were located between the retorts, a single channel received the gas from the retorts on either side of it; but a partition could, if desired, be used to isolate the retorts. The heating furnace employed was adapted to discharge the products of combustion into the chamber and around the retorts; but in order that the products of combustion might be properly distributed in the chamber, and to prevent loss of heat from the direct passage of the products to the chimney, the heat retaining chamber was divided into a number of sub-chambers by horizontal partitions, and each partition was provided with an opening for the entrance of the products of combustion from the furnace either directly or through one of the other chambers. Retort stoppers were employed, connected to hand levers adapting them to be withdrawn from the retorts and moved from over or under same during the charging and discharging operations. Weights were to be used on the levers attached to the lower stoppers, to counterbalance the contents of the retorts.

In the apparatus shown in fig. 5, a single retort of annular form provided with an outer annular gas channel was used, and the products of combustion from the heating furnace were carried upward through the central aperture and returned around the exterior of the gas channel. The retort, however, was furnished with several charging and discharging openings, as described.

The apparatus was further modified in fig. 6 by arranging series of retorts around a central aperture leading to the heating furnace, and placing the gas channels between the retorts. A similar arrangement is illustrated in fig. 8; but in this case the lower ends of the retorts were curved outwardly. In charging the retorts the upper stoppers were to be removed, and the retorts filled with coal, after which the stoppers were replaced. To discharge the retorts after the illuminating gas had been expelled from the coal, it was only necessary to remove the lower stoppers, when the coke fell, by reason of its weight, into coke-barrows placed beneath them.

In case it was found, in discharging the contents of the retorts, that pieces of coke lodged in the lateral openings, the openings were inclined, as shown in fig. 9; and in case of adhesion of coke to the surface of the retorts, it was proposed to provide them with plungers to be lowered into the retorts to remove the pieces.

In concluding the specification of his invention, the patentee remarks: I do not limit myself to the use of a heating furnace of any particular construction, or to any peculiar manner of applying the heat necessary to effect the production of gas in the retorts, or to the use of a heating furnace, as gas generated in the retorts, or by another process distinct from the one described, may be carried to the interior of the casing and ignited therein. Further, I do not confine myself to any specific construction or arrangement of the partitions which divide the heat-retaining chamber into a series of communicating sub-chambers to which the products of combustion from the furnace are successively conducted in their passage to the chimney. I am aware that it is not new to construct a vertical gas-retort with lateral openings situated at different heights for the escape of gas, and with means for carrying the gas from the lateral openings to a gas receptacle; also that vertical retorts having lateral openings have been built in brickwork and heated by the action of the products of combustion from a furnace, which products of combustion are conducted into a space in the brickwork, and deflected towards the exterior surface of the retort by means of interrupting blocks. I am also aware that in coke-ovens and analagous apparatus it is not new to contruct a retort in sections, and that vertical retorts have been provided with stoppers and devices for operating them. But I am not aware of the existence, prior to my invention, of a retort or series of retorts having lateral openings at different heights arranged around the circumference of the retorts, and channels to receive the gas discharged through the lateral openings, which channels convey the gas to a stand-pipe; the whole of the apparatus being enclosed in a heat-retaining chamber having partitions therein, which divide the chamber into a series of sub-chambers, and distribute the products of combustion conveyed to the chamber from a furnace.

THE SYNTHETIC CYANIDE PROCESSES.

By Dr. FRITZ ROESSLER, of Frankfort-on-Maine.

[Extract from a Paper read at the Berlin International Congress of Applied Chemistry, in June.]

The present world's consumption of cyanide may be said to be supplied by four synthetic processes, leaving out of account the ever-diminishing quantities made from potassium ferro-cyanide and sodium, and the cyanogen obtained from beet sugar residues (schlempe) as not being, properly speaking, synthetic processes. The four processes are: Siepermann's process in Stassfurt, Beilby's process in Glasgow, the Raschen process of the United Alkali Company, and the improved Castner process. Far away the greater part of the many other cyanide processes patented have never reached the practical manufacturing stage, because the inventors overlooked the fact that, for practical purposes, the important matter is not to discover a new method of synthesizing cyanides, but to find a practical and cheap way of producing a saleable commercial article.

The difficulties which are to be overcome in producing a finished commercial product from the cyanide containing mixtures obtained in most synthetic processes are well exemplified by the Stassfurt process, as described in recent patents. This process, like that of Beilby, sets out from potash, charcoal, and ammonia. To-day, ammonia still remains the only source of nitrogen used in the synthetic processes which are actually producing cyanide. The reactions given by Siepermann as representing his process are—

$$K_2CO_3 + NH_3 = KCNO + KOH + H_2O.$$
$$KCNO + C = KCN + CO$$

According to more recent researches, the process appears, however, to take place as follows:—

$$K_2CO_3 + NH_3 = CO.NH_2.OK + KOH$$
$$CO.NH_2.OK = KCNO + H_2O$$
$$2\,KCNO = K_2N_2C + CO_2$$
$$K_2N_2C + C = 2\,KCN$$

The separation of the various products of the reaction is accomplished by means of their different solubilities at different temperatures.

Beilby has succeded in avoiding the difficulties of lixiviating, and obtaining the cyanide from aqueous solution by working directly for a high strength fused cyanide. He succeeded in this by reducing the melting-point of the working mixture by adding ready-made cyanide to it.

The United Alkali Company's process, which consists essentially in the oxidation of sulphocyanides with nitric acid, is, from the chemical standpoint, a very elegant process. Technically, however, it is extremely complicated; and, above all, it does not produce a fused product.

The cyanogen content of pure sodium cyanide is proportionally higher than that of pure potassium cyanide; but until recently it was not possible to produce pure high strength sodium cyanide. The working out of the Castner synthesis from metallic sodium and ammonia has now, however, led to this result. Castner himself gave the following equations as representing his process:—

$$Na + NH_3 = NaNH_2 + H$$
$$NaNH_2 + C = NaCN + H_2$$

It has been proved, however, that the reaction is more complicated; it taking place as shown in the equations:—

$$Na + NH_3 = NaNH_2 + H$$
$$2NaNH_2 + C = Na_2CN_2 + 2H$$

Or

$$NaNH_2 + NaCN = Na_2CN_2 + H$$
$$Na_2CN_2 + C = 2NaCN$$

Although metallic sodium is a comparatively costly raw material, this synthesis is considerably cheaper than that which sets out from soda, charcoal, and ammonia, as the apparatus is simple, and the yields are good. It is noticeable here, as in other cases, that in synthetic processes it is most important to set out from raw materials of the greatest possible purity, even though their preparation is attended with considerable expense.

Considering the many synthetic methods of preparing cyanides which have been proposed, in the light of practical experience, it is obvious that by far the greater part of them merely attempt to synthesize cyanides or hydrocyanic acid, and that they quite overlook the enormous difficulties which arise when an attempt is made to prepare a commercial finished cyanide from the cyanogen containing materials obtained. This is especially true of the many processes which attempt to work with atmospheric nitrogen. None of these have so far been successful, although the raw material cost nothing. The cost of producing the high temperature, the destruction of apparatus, and the cost of purifying the product obtained are excessively high.

A COMPARISON BETWEEN THE FIRST COST OF INCLINED AND HORIZONTAL RETORTS.

By M. FRÈRE, of St. Quentin.

[A Paper read before the Societe Technique du Gaz at Toulon.]

Of the papers read up to the present before Gas Societies in France and abroad, on the subject of inclined retorts, some have compared the working expenses of the same with those necessitated by horizontal retorts with or without mechanical appliances.* Others have stated the technical conditions of construction and working, as well as the absolute amount of first cost †; but the figures given—especially as regards the last point—have not enabled us to compare exactly these two types of retort settings. For example, Herr Merz, speaking of one of the complaints made against inclined retorts ‡—viz., the heavy cost

* See a paper by M. Godinet. "JOURNAL," Vol. LXXX., p. 817. Also a communicated article by Mr. W. R. Herring. "JOURNAL," Vol. LXXVIII., p. 1160.

† See a paper by Herr Merz. "JOURNAL," Vol. LXXX., p. 684. ‡ *Idem.*

of their construction—adds "that he has found it impossible to obtain comparative figures for Germany and the Continent, as to the expenses of putting up horizontal retorts with stoking machines, and arches on the Coze system." He then quotes figures found in the "JOURNAL," of "£63 for inclined retorts and £76 for horizontal retorts." It has, therefore, seemed to me to be of interest to put before you an examination of this particular question—making a special point of having identical conditions in the two cases.

The two installations that I wish to examine are capable of carbonizing 60 (French) tons of coal per day, corresponding to about 17,000 cubic metres of gas (600,382 cubic feet). They consist of four arches of nine retorts, 6·10 m. long (20 feet). This length being the same, we can reckon that, the amount of heat radiated from the walls being equal, the make of gas and the cost of fuel will also be the same. With a view of facilitating the use of all kinds of fuel (coke, coal, mixed coke, breeze, and small coal), each arch has in both cases two producers—one in front and the other behind. Further, a middle wall divides each arch into two distinct parts. The whole of the brickwork of the arches, including the producers, is placed above the ground, which necessitates strengthening the buckstays and piers, and making the elevators longer. The ground being supposed to be of sufficient resistance, the benches merely rest on a bed of concrete 40 cm. thick (16 inches.) The houses, up to about two-thirds of their height, are built of brick walls 45 cm. thick (17¾ inches); the upper part being constructed of iron-frames and perforated bricks 11 cm. thick (4⅜ inches). As regards the coal-handling plant, provision is made for 45 tons (*i.e.*, the quantity required for carbonization in 18 hours) to be stored in hoppers above the arches, fed by an elevator, after the coal has been broken by a roll-breaker. The retort-charging is done mechanically (in the usual and quite simple way for the inclined retorts) and by the De Brouwer machine, which is one of the systems applicable to charging retorts of this length, for the horizontal retorts. The discharging is also mechanical—by gravity in the first case, and by a ram (as for coke-ovens) in the second case. From the retorts, the coke is taken by a hot-coke conveyor and, in our particular case, carried by another conveyor to the coke-breaker.

The prices that we have taken apply particularly to works in the North of France, where they are quite favourably situated in regard to proximity to the producers of raw material, iron, and fire-clay goods. Nothing for town duties (*octroi*), nor for patent royalties, is included.

The first table—based on these conditions—appears to me to fulfil all the guarantees that I laid down as to comparability. According to it, the construction of inclined retorts amounts to £6501, against £6850 for horizontal retorts—that is, a difference of £349 in favour of inclined retorts. These prices split up as shown in the second table bring out the following:—

	Horizontal Retorts.	Inclined Retorts.
Per retort	£190 5 6	£180 11 8
Per 1000 cubic feet of gas made in 24 hours	11 8 2	10 16 7
Per (French) ton of coal in 24 hours	114 3 4	108 7 0

Perhaps it may be objected that I have provided for two hydraulic mains per arch for the horizontal settings, instead of one only for the inclined retorts. I have done this because it is so arranged in all works which have their arches back to back, the retorts of which communicate one with the other, and it is, in my opinion, necessary. However, if we wish to have conditions absolutely identical, without entering into these considerations, it can be done by deducting from the cost of constructing the horizontal retorts £249 8s., which is the increased cost caused by this item.

Hydraulic mains	£264 12 0,	instead of	£302 8 0
Cast iron of front (heavier than before)	420 0 0	,,	369 12 0
Cast iron of back	107 12 0	,,	369 12 0
	£792 4 0	instead of	£1041 12 0

Difference £1041 12s. − £792 4s. = £249 8s. This still leaves an excess of £349 − £249 8s. = £99 12s.—say, £100—for the horizontal retorts.

The use of machines for charging and discharging leads, besides, to an expense for power, and to charges for maintenance in one case, which we do not find in the other, and which are not compensated for by a reduction in labour; for in a paper* by Mr. Drory, of Berlin, on Jan. 6, 1902, it results as follows:—

	Horizontal Retorts.	Inclined Retorts.
Per ton of coal carbonized	15·696d.	10·8096d.
Per 60 tons	£3 18 5·76	£2 14 0·576

That is, an excess of over £1 4s. per day.

I have not the details so as to value the expense for power and the charges of maintenance; but they only make more unfavourable the working of horizontal retorts. From all the foregoing, you can, therefore, agree with me that, being given the tendency (which shows itself more and more every day in our industry) to adopt to the utmost mechanical means for retort-house work, inclined retorts offer, not only from the point of view of constructional cost but also from that of simplicity of working, indisputable advantages over horizontal retorts.

* See a communicated article by Mr. Ed. Drory, of Berlin. "JOURNAL," Vol. LXXIX., p. 478.

Comparative Net Costs of a Bench of Four Arches of Nine Inclined Retorts, 20 Feet Long, and a Bench of Four Arches of Nine Horizontal Retorts, 20 Feet Long, with Mechanical Charging and Discharging Arrangements. Coal carbonized, 60 tons in 24 hours.

FIRST TABLE.

A.—RETORT-BENCH.

	Horizontal Retorts.	Inclined Retorts.
1. Foundation for bench—		
1. Excavation reckoned at 8·7d. per cub. yd. (1 fr. 20 c. per cub. met.)	£2 8 0	£2 4 0
2. Concrete 16 in. thick at 13·9s. per cub. yd. (23 fr. per cub. met.)	45 8 0	39 12 0
2. Exterior of arches with archings and inside linings in Boulogne bricks, including end walls—		
1. Fire-clay brickwork	324 8 0	441 16 0
2. Red brickwork and arches	163 16 0	237 4 0
3. Interior of arches, regenerators, and producers on both sides, first quality Boulogne retorts, special fire-bars and furnace doors—		
1. Blocks, retorts, fire-clay brickwork	1172 16 0	1602 8 0
2. Red brickwork and arches	90 8 0	87 12 0
3. Fire-bar castings, fittings, and sundries	302 8 0	302 8 0
4. Framework for bench, end walls, front and back, tie-rods, springs, glands, and fastening plates	115 12 0	246 16 0
5. Main flue to chimney	19 4 0	19 4 0
6. Hydraulic mains—Separate, dip level valves—		
Horizontal retorts, eight hydraulic mains	302 8 0	..
Inclined retorts, four hydraulic mains	..	264 12 0
7. Castings, self-sealing retort mouthpieces, ascension-pipes, bridge and dip pipes, bolts—		
1. Castings for front	369 12 0	420 0 0
2. Castings for back	369 12 0	107 12 0
8. Working stages, iron and brick flooring, front and back—		
Horizontal retorts, 514 sq. yds. covering two floors	232 16 0	..
Inclined retorts, 568 sq. yds. covering three floors	..	339 4 0
9. Bucket elevators, including framework, roll coal-breaker, elevator pit, and top shoot—		
Horizontal retorts, length of chain 82 feet	147 0 0	..
Inclined retorts, length of chain 131 feet	..	243 12 0
10. Coal-hoppers in sheet iron 7-32 in. thick, strengthened by tie-rods, supports, and joists; capacity 45 tons—with horizontal conveyor and wood platform; ladders to the wooden gantry	502 0 0	502 0 0
11. Charging apparatus, including track, travelling, placing in position, two machines in both cases, of which one is in reserve	701 8 0	126 0 0
12. Discharging ram—one only	440 0 0	..
13. Hot-coke conveyor	400 0 0	400 0 0
	£5701 4 0	£5382 4 0

B.—RETORT-HOUSE.

1. Foundations—		
1. Excavation	£2 0 0	£1 16 0
2. Brickwork	36 8 0	34 0 0
2. Walls, 18 inches—		
For horizontal retorts 18 feet high	166 16 0	..
For inclined retorts, 24 ft. 7 in. high	..	211 4 0
Iron framework and 4½ in. filling in—		
For horizontal retorts, 13 feet high	210 4 0	..
For inclined retorts, 18 feet high	..	299 4 0
3. Roof and tiling—		
For horizontal retorts, height of principal 13 ft. 9 in.	678 12 0	..
For inclined retorts, height of principal 13 feet 1 inch	..	519 4 0
	£1094 0 0	£1065 8 0
Unforeseen, 5 per cent.	54 16 0	53 8 0
	£1148 16 0	£1118 16 0
Retort-bench	£5701 4 0	£5382 4 0
Retort-house	1148 16 0	1118 16 0
	£6850 0 0	£6501 0 0
Difference in favour of inclined retorts	£349	
Assuming one hydraulic main only	£6600 12 0	£6501 0 0
Difference in favour of inclined retorts	£99 12 0	

SECOND TABLE.

A. Retort-bench—		
Brickwork, flues, buckstays, mountings, hydraulic mains, working stages	£3510 16 0	£4110 12 0
B. Coal plant—		
Elevators, coal-hoppers, conveyor	649 0 0	745 12 0
C. Stoking machinery—		
Charging apparatus and discharging ram	1141 8 0	126 0 0
D. Coke plant—		
Hot-coke conveyor	400 0 0	400 0 0
E. Retort-house—		
Foundations, walls, roof, tiling, unforeseen	1148 16 0	1118 16 0
	£6850 0 0	£6501 0 0
Assuming one hydraulic main only	£6600 12 0	£6501 0 0

THE ENGINEERING CONFERENCE.

The sitting of Section VI. of the Engineering Conference on the last day was devoted principally to the consideration of water-supply matters; and from them we give the greater part of a paper by Mr. Percy Griffith, M.Inst.C.E., with a few notes from the discussion. Before, however, directing attention to these, some important remarks should be published which Sir Alexander Binnie addressed to the section at the previous day's sitting.

Rainfall Records—An Appeal to Water Supply Undertakers.

Sir Alex. Binnie said he had a suggestion to make for the future. It was a subject connected with both sewage and drainage on the one hand and water supply on the other. In the consideration of these large questions, he said they had to commence more or less with the fundamental natural phenomenon. He alluded to the subject of rainfall. About rainfall some part was known, but not so much as they could wish to know, or so much as they ought to know. However, certain broad conclusions were being gradually arrived at, one of which was that to establish a mean or an average annual rainfall, observations had to be conducted carefully and collated over a period of something like 33 to 35 years. Having arrived at the mean rainfall, they had also, by the continued efforts of various engineers, succeeded in ascertaining, in a rough way, the fluctuations to which the rainfall was subject. They knew, for instance, that by deducting about one-fifth, they arrived at the probable rainfall of the three driest consecutive years; and, by making further percentage reductions from the mean fall, they came at what would probably be the rainfall of the two driest consecutive years. It had also been discovered, within limits, that the rainfall of any one year might be 50 per cent. above or below the mean fall. These were broad facts gained by simple observation; but they were not perhaps so accurate as could be desired. They formed more or less the working data on which they had to depend. Turning, however, from the consideration of rainfall under this simple observation to the practical application of the data to the needs of their profession, they found themselves in a far less satisfactory state. From the rain which fell, there must still be deducted certain percentages; those percentages being veiled generally under two heads—evaporation and absorption. The actual amount of loss from the rain that fell varied in almost every district. What he, therefore, hoped for was that gentlemen connected with large water-works and large drainage works would induce the great bodies under whom they served to initiate something like accurate records, because, with the various factors to be taken into account, they were becoming too large and too expensive to be attacked by private engineers or other individuals. Yet, at the bottom, they involved the economical construction in the future of many of the large works. This, he considered, was one of the unsolved problems connected with the profession.

Mr. Percy Griffith's paper was (with a few omissions here and there) as follows:—

THE RAISING OF WATER BY COMPRESSED AIR.

Among the many mechanical expedients known to engineers at the present time, there are few that have come into common use more rapidly than the application of compressed air to the raising of water from wells and borings. In this case, however, as in many others, we find that the practical application of a system has far preceded the appreciation and understanding of the natural laws by which it is governed, with the inevitable result that, on the one hand, where success has been achieved, the advantages have been grossly exaggerated, and on the other, the failures have provoked unwarranted condemnation. No doubt the factor which is mainly responsible for this state of affairs is the simplicity of the apparatus involved. An air-compressor, driven by steam or electricity, with an air-pipe and a water-pipe having no moving parts, are the only requirements for the lifting of large quantities of water to considerable heights under conditions which, in some instances, would be fatal to the ordinary form of pump.

At this point, however, the simplicity of the system, and especially of the laws under which it operates, absolutely ceases; and the more carefully it is investigated, the more complex and indefinable become the problems presented by it. It is therefore very desirable that, instead of blindly experimenting with cases where failure may involve large sums of public money and the water supply of communities (whether large or small), engineers should at once set themselves to a careful investigation, both of the natural laws which govern its operation and of the details of construction, which are essential to its successful application. The proper proportion between the immersion of the air-nozzle and the total "lift" of the water, and between the diameters of the air and water pipes and the quantity of water to be lifted, the best form and the proper position of the air-nozzle, the relative cross-sectional areas of the air and water pipes, and whether the air-pipe should be inside or outside of the water-pipe, are all points upon which but little is definitely known and upon which practice varies to a very tantalizing extent—in fact, it must be admitted that in almost every case these points are left entirely to experiment and have never been settled with anything approaching finality. Under these circumstances, it is evident that, while no guarantee of success can be given in any particular instance, any attempt to estimate the duty or efficiency of any given plant is absolutely out of the question; and when this is done, it is obviously based entirely upon speculation, and the chances of realization are very remote.

Having pointed out the features of the system which are at present awaiting further explanation, the author proceeded to state briefly the broader aspects in which the suitability or otherwise of this very simple method of raising water is more obvious: In considering the advantages of the system, it must be emphatically stated at the outset that economy is not one of them, in spite of the claims made by some manufacturers. So far as it is possible to arrive at any comparison at all, with the very meagre results at present available, the consumption of fuel with an air-lift plant will be at least three times as much as with an ordinary pump of an equal standard of general excellence and cost. Thus it may be taken as beyond dispute that, other conditions being equal, an air-lift plant cannot possibly compete with its older rival in respect of cost of fuel.

This being granted, there are, however, many circumstances under which the use of compressed air for lifting water is more than justified, and where, in fact, it may prove the only solution of an otherwise insurmountable difficulty. The following cases may be accepted as typical: (1) For temporary use either in testing a well or boring, or in freeing a new boring of the floating dirt, sand, or *débris* which always remains when boring operations are concluded. (2) For permanent use where the water is derived from sand or gravel beds, and the sand cannot be entirely shut off from entering the boring. In both these cases, the absence of valves in contact with the water renders the air-lift system of great value—in fact, the author has met with several examples where the presence of sand in the water rendered the use of any ordinary form of pump impossible. (3) From a boring of any given diameter, a much larger yield can be obtained by this system than with any other; and thus in many cases the use of an air-lift plant will avoid (or at least postpone) the necessity for sinking an additional boring—of course, at the expense of increased cost of fuel—and in others the hours of pumping can be materially reduced. (4) In cases where time is an important element, a simple air-lift plant of moderate capacity can be installed much more quickly than an ordinary pump, especially the part fixed in the boring. This is of the utmost importance when any prolonged interference with the boring would involve the interruption of the water supply of a town. It must be observed, however, that this advantage does not apply to installations of a capacity exceeding 15,000 gallons per hour, where compressors of sufficient size are not obtainable from stock or on hire, or to cases where economy in working is essential and the plant has to be elaborated for this purpose. (5) The initial cost of small air-lift plants, where economy of working is not essential, is decidedly less than that of an ordinary engine and pump, especially in respect of foundations and buildings. For large installations, and where economical working is important, the author does not believe this is the case, although no figures can be given from actual practice. (6) Where the supply of water is derived from a number of borings or wells in the same neighbourhood, a single air-compressing station will serve all the borings, and no plant or supervision need be provided at each boring. It is, however, not quite clear whether the comparative economy of oil-engines would not more than compensate for the expenses involved by multiplying power stations within certain limits.

In conclusion, attention may be called to a few general points which should always be borne in mind when an air-lift installation is in contemplation: (1) The proper depth or immersion of the air-nozzle, and the quantity of air required per unit of water lifted under different conditions of water-level, can only be ascertained by experiment in each case. (2) The air-lift system is only applicable to wells or borings in which the water stands under a considerable "artesian" head—*i.e.*, rises to a considerable height above the point at which it is tapped. (3) By the air-lift, the water-level can never be lowered much more than one-half the depth of the boring. (4) High lifts involve a great reduction in the efficiency of compressed-air plants and a corresponding increase in the proportionate cost of fuel. It is therefore never advisable to use this plant to lift water above ground-level. The provision of a separate force-pump for this purpose involves extra initial cost as well as increased working expenses. (5) The air-nozzle must be designed so that the rush of air does not impede the flow of water at the point of discharge. (6) It is obviously better to carry the air-pipe down the boring outside the water-pipe or rising-main in order to give increased area to the latter, and to avoid the friction caused by the sockets on the air-pipe. In most cases the diameter of the boring will enable this to be done without difficulty. (7) The air-pipe must be large enough to avoid any unnecessary friction therein. The difficulty of this lies in the impossibility of previously determining the quantity of air required in any particular case. (8) Until some definite basis is arrived at for the calculation of the proportions of the various parts of the plant, the system cannot be applied with any certainty of success or with any previous knowledge of the cost of fuel per unit of water lifted. The advantage of

increasing the area of the water-pipe towards the surface level (as advocated by one firm) has not yet been sufficiently proved. (9) The economy in repair and maintenance, due to the absence of wear and tear in the plant fixed in the well or boring, is not as important as it appears at first sight.

Discussion.

The discussion was somewhat hurried; the paper having been left to the end of the sitting. From the remarks made, it appeared that Mr. Baldwin Latham conceived that the system the author had brought to their attention would be a convenience under some conditions, but a drawback unless there was something special about the boreholes. His own experience with regard to the use of air in any position was that it was a most expensive mode of raising the water. He spoke of the low efficiency of the machine, mentioning a case in which the efficiency was stated to be only 5 per cent.! Several points were commented upon by Mr. Halpin Druitt, and then the inquiry was put by Mr. Walter Hunter as to whether this sentence in the paper represented Mr. Griffith's experience: So far as it is possible to arrive at any comparison at all . . . the consumption of fuel with an air-lift plant will be at least three times as much as with an ordinary pump. Mr. J. Dewhirst had had a short experience with an air-lift of small capacity. In this case, it was fixed in a boring in which there had been, in the first instance, a pump fixed; but the latter, through the inrush of sand, was ruined in about two days. In designing an air-lift, his opinion was that the interior of the water-tubes should be kept as free from obstruction as possible. Saying this, it followed that the air-tube should be kept out of the interior of the water-tube. The interior of the air-tube should also be kept as free from obstruction as possible, so as to give a free air-way down it. He certainly got more than 5 per cent. efficiency; roughly speaking, it was nearer 35 to 40 per cent. The system had been used by Mr. William Morris for testing borings. For this purpose, he had found it efficient; but he should never think of using it permanently. He had asked several contractors whether they would guarantee a 50 per cent. efficiency; but they would not undertake to put the plant down under that condition.

The question was put by Mr. H. D. Pearsall as to whether the author had attempted to measure the size of the air bubbles. It seemed to him that this was a matter upon which the efficiency of these machines greatly depended. What happened was that the bubbles rose up through the water, passing much quicker than the water itself. The smaller the bubbles, the quicker they passed up; and consequently what should be aimed at was to have bubbles of the smallest dimensions. But, of course, as they rose, they coalesced. This was one reason why the high lift became so inefficient—that the small bubbles could not be maintained through it. Pointing out that an efficiency of only 5 per cent. was absolutely out of the question, Mr. S. R. Lowcock said the greatest theoretical efficiency that could be got out of compressed air was about 35; but they knew this could not be obtained in practice. This therefore brought them down to somewhere about 25 per cent.; so that it was not possible this air-lift could be anything more than a temporarily useful measure. Mr. W. Matthews sought information as to what was the greatest distance that had been worked between the compressing station and the pumps. It seemed to him there might be some chance for using this machinery where one could have the compressing-station in one place and the pumps working in another. In his opinion, the low theoretical efficiency of the machine put it out of the market for permanent work. Within reasonable limits, too, it should be possible for the makers to say what ought to be the quantity of air required for a given volume of work. If they could not do this, then there must be something curious about the system which did not render it a proper machine for use at present.

Reference was made by Mr. H. Ashton Hill to some elaborate tests that had been carried out at Charlottenburg with the air-lift. These showed that as the quantity of water increased, the air required increased, and the efficiency decreased. The best efficiency attained was 45 per cent. This was working at a slow speed, and the efficiency sank to 28 per cent. as the quantities increased. He instanced cases in his own recent experience where an air-lift would be of no use, and spoke of the benefit derived from the use of a pulsometer for temporary work. Mr. Price, of the firm of Messrs. Le Grand and Sutcliffe, described the paper as rather caustic in the earlier portions, but fair throughout. He heartily sympathized with the author because he himself had been trying to get at the truth about this air-lift. Even in connection with the experiments referred to by Mr. Ashton Hill, when they came to try to get similar results, it was found that the experiments had been made intelligently up to a certain point, but had not been continued intelligently. As a result of their experiments, his firm had improved on the air-lift; but he was anxious to get confirmatory figures as to the efficiency. Mr. Griffith, in the course of his reply, said his association with this system was not so much one of experience as investigation and inquiry. The discussion had confirmed, as he expected it would, the general conclusion to which he had arrived—that, in regard to the actual working results, the efficiency, and all the detail to which he had referred in the paper, there was just at present very little definite knowledge. From what had been said, and from his own inquiries, he thought they might look upon the maximum efficiency as something between 40 and 50 per cent.

REGISTER OF PATENTS.

Machines for Charging and Drawing Gas-Retorts.—West, J., of Manchester. No. 13,960; June 19, 1902.

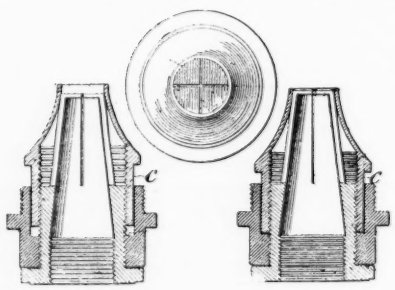
This invention has for its object the combination in one machine of mechanism both for charging and drawing retorts, all mounted on one frame, and supported on wheels provided with gearing for travelling the machine along the retort-house in front of the retorts to be charged and drawn. It also includes mechanism for charging and drawing mounted as one complete machine, with all the levers and other mechanism under the control of the attendant arranged in a convenient position so that he can direct the various operations of either charging or drawing the retorts while standing in one position on the same machine. Operations that are common to both charging and drawing machines—such as are affected by the motor and travelling gear and the hoisting gear for raising the coal-hopper and charger and the rake-head to the several tiers of retorts—are in this way performed by one set of gearing, instead of two sets as required by two separate machines.

The arrangement referred to was fully described and illustrated in the "JOURNAL" for Dec. 16, 1902, p. 1607.

Gas-Burners.—Brachhausen, G. A., of Rahway, N.J., U.S.A. No. 621; Jan. 9, 1903. Date claimed under International Convention, Oct. 18, 1902.

The object of this invention is to provide a device in which the flow of gas is regulated without placing in its path "any obstruction that would tend to deflect the gas from its normal path."

The body of the burner is tubular, and at the upper end of the screw-threaded portion the bore of the body is tapered as shown. The upper part of the body is of smaller diameter, and provided at the top with a plane cap or cross-plate, with slits so arranged as to cross each other. The upper end of the tubular body, on account of its being slit, has considerable elasticity, and automatically tends to assume the form shown in the left-hand view, where the slits are wide open. This is the case when the regulator C is in its upper position and



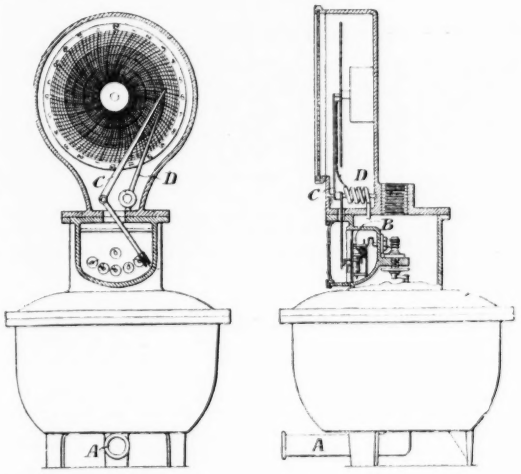
exerts no clamping action on the upper end of the tube. When the regulator is screwed down, the slits are gradually closed; and at a certain point the slits in the cross plate will be closed entirely, as shown in the right-hand view. By this arrangement, as the gas issues from the slits "it is prevented from spreading laterally into a fan-shaped volume, but is shot straight upward in a stream of even width. Thus, the gas is not liable to impinge against the parts of the burner carried above the regulator; and a deflection of the gas current with the disturbing eddying action that would follow therefrom is avoided. The employment of cross slits in the plate is of material advantage, in that the outflowing stream of gas is brought in contact with a very large body of air; it being understood that this stream in horizontal section has substantially the shape of a cross."

Recording Apparatus for Meters.—Wittmer, G. X., of Pittsburg, U.S.A. No. 5254; March 6, 1903. Date claimed under International Convention, March 8, 1902.

This invention has for one of its objects to provide means for recording both the pressure and the volume of gas flowing through a meter at each instant of time during operation. A further object is to provide a chart having a series of multipliers, the products of which, by the corresponding pressures as recorded on the chart, shall equal the volumes of gas at a given constant pressure. The invention is not limited in its application to any specific type of meter or to the measurement of any particular fluid; but, by way of example, the patentee describes it as applied to a gas-meter. The meter shown may be considered as one through which the entire volume of gas passes, or as the tally member of a proportional meter.

The casing of the meter contains ordinary measuring devices, and is supplied with gas through the pipe A. B is a train, operating in the usual way, by which the total volume of gas passing through the meter is registered upon dials by pointers. At the top of the meter casing is a frame or chamber the back plate of which is provided with clock mechanism to rotate a disc carrying a scale or chart, which latter is constituted by transverse or radiating curved lines corresponding to time intervals; and concentric, circumferential lines corresponding to different gas pressures. Outside the space subdivided by the latter lines, is a space upon which is recorded the successive volumes of gas passing through the meter. The record within this annular space is made by a marking point mounted upon the free end of an arm C connected to a rocking shaft. This arm receives motion through an arm connected to the same shaft, its free end being provided with a slot with which engages the pin of a crank rotated by a shaft or spindle of the registering train B. The arms of the crank are so proportioned that a complete revolution of the crank moves the extremity of the

pointer C so that, as the chart rotates at a uniform speed, the number of complete movements of the stylus across the space within a given interval of time (as indicated by the lines marked on the diagram) will show the volume of gas passing through the meter for each division of time during which it was in operation—a new chart being required in this instance upon the completion of each period of twenty-four hours.

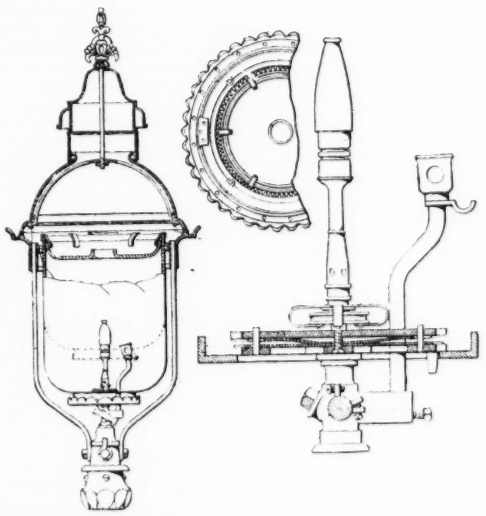


The record of pressure of gas is made by a marking point D carried by the arm which is attached to one end of a helical tube, having an open end which projects into the space behind the dial of the meter. This tube is proportioned, and of such suitable material, that variation in the pressure of the gas passing through the meter moves the stylus over that part of the chart which is provided with the circumferential lines indicating pressures. In the engraving, it is shown at its outermost or zero position, and moves inwardly towards the centre of the chart.

In order to enable the user of the instrument to readily determine the volumes of gas corresponding to a given constant pressure, each circumferential line is provided with a multiplier corresponding to the pressure indicated by that line. In the example, the multipliers are so determined and selected as to correspond to the constant pressure of 8 oz.; and the lines represent differences of 2 lbs. in pressure.

Street Gas-Lamps.—Franklin, J., of Cincinnati, Ohio, U.S.A. No. 2500; Feb. 2, 1903.

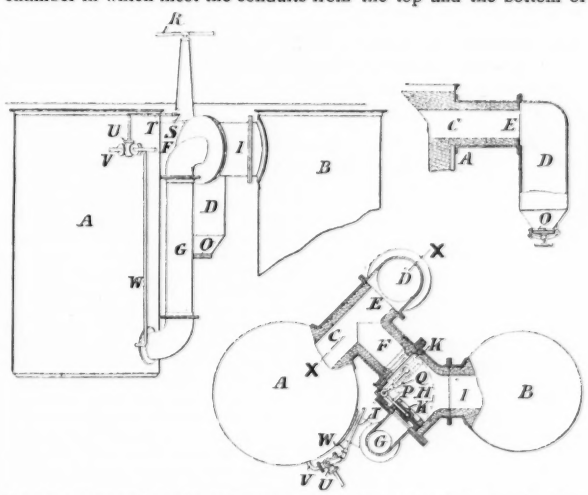
This type of gas-lamp is of the class particularly adapted for street or outdoor lighting; the object of the inventor being to provide a lamp of this character which shall be stronger, more durable, and better adapted for cleaning, lighting, and repair. He describes certain novel features of the lamp whereby certain advantages are claimed to be attained. The general arrangement of the lamp will be gathered from the accompanying sectional elevation, partial plan (the hinged dome and hood being removed to show the interior of the device), and enlarged fragmentary sectional view taken through the wind-guard of



the lamp, showing the burner, anti-vibratory support, and gas-cock in elevation. It will be seen there are in this gas-cock four gas-passages, two of which are arranged to intercommunicate with one another; while one of the passages is provided with a regulating means. A cock-plug, formed with a gas-passage at one end, is arranged for communication with one gas-passage of the casing at all times, and is adapted for communication with the passage having the regulating means when the plug is moved. The other end is adapted, in the movement of the plug, for communication with the last-named passage and with each of the two other gas-passages in the casing.

Water-Gas Generating Apparatus.—Glasgow, A. G., of Victoria Street, S.W. No. 6311; March 18, 1903.

In order to prevent the dust and "flyers" contained in gases issuing from the generator of water-gas apparatus from entering connected vessels—for instance, the carburetting or regenerating chambers—the patentee proposes to furnish the conduit leading from the generator to the connected vessel with a dust interceptor comprising a chamber placed at the end of, and communicating with, the outlet-conduit from the generator, and provided with a branch leading to the connected vessel. The arrangement is such that the gases issuing from the generator, and carrying dust and "flyers," travel towards the dust-chamber; and the dust and "flyers," by reason of their greater momemtum, will continue to travel in the same direction, and will enter and be caught in the dust-chamber, while the gases turn into the branch leading to the connected vessel. In water-gas apparatus provided with this arrangement in the outlet from the generator, the flow of gas from the top or bottom of the generator may be controlled according to requirement by means of a reversing valve in a valve-chamber in which meet the conduits from the top and the bottom of



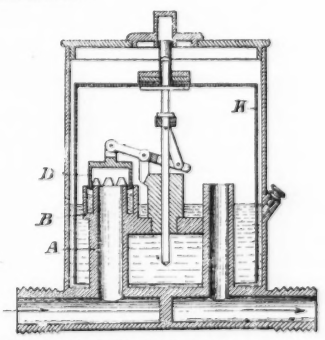
the generator and to the carburettor or other connected vessel. The reversal of the valve also causes the reversal of the steam-cock which controls the supply of steam to the top or bottom of the generator.

The illustration shows in side elevation as much as is necessary of a water-gas generating apparatus according to this invention; also a sectional plan and a detailed sectional elevation on the line X.

A is the generator, B the carburettor, C the conduit for leading the gas from the top of the generator, D the dust chamber communicating through the opening E with the end of the conduit C, F is a lateral branch, G the conduit for leading gas from the bottom of the generator, H the reversing-valve chamber, I the conduit leading therefrom to the carburettor, and K the reversing valve. The dust-chamber is shown cylindrical and arranged vertically; the bottom portion tapering to an opening closed by a lid O for the purpose of emptying the chamber when necessary. The interceptor may be placed between the reversing valve and the carburettor or other connected vessel; and it will be often desirable to place one interceptor before the valve and another after it. The reversing valve K may be carried on an arm P projecting from a spindle or hinge-pin Q, provided externally with an operating lever R and a suitable means of firmly holding the valve against either seat. The spindle Q, with a crank-arm S connected by a link T to the plug of a cock U, will control the supply of steam to the top or the bottom of the generator through pipes V and W respectively, according to the position of the reversing valve; the steam-cock and valve being actuated by one operation.

Gas-Regulators.—Friedrich, A., of Ueckermünde, Germany. No. 8651; April 16, 1903.

The regulator to which this invention relates is said to be distinguished from other similar regulators by the fact that it is the regulating valve which is shifted, while the sealing liquid (mercury), in which the valve dips, remains immovable.



As shown, the nozzle of the feed-tube A, for gas, is surrounded by a circular cup B, intended to receive mercury or other liquid in which dips the regulating valve D, the edge of which is notched. The regulating valve is connected to the guide-spindle of the bell K by a two-armed lever.

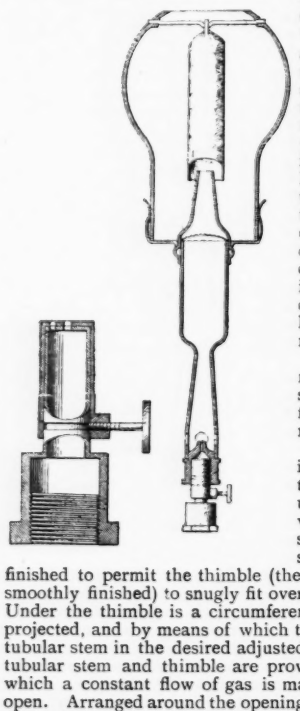
When the gas pressure is normal, the notches of the regulating valve dip to a certain depth in the mercury cup. But if, for any reason, the pressure increases, it exerts a certain pressure upon the bell K, so that the latter will be lifted. This upward motion of the bell induces the lowering of the regulating valve, the notches of which dip further into the mercury. The throttling of the exit, produced in this manner, causes a decrease of the inlet of gas, which only ceases when the pressure of gas again decreases.

Gas-Engines.—Burger, L. F., of Anderson, Ind., U.S.A. No. 8490; April 14, 1903,

This invention has for its object to improve the construction and arrangement of the governing valves of gas-engines, whereby the air and fuel may be admitted to the combustion chamber in relative amounts to secure the most efficient operation with the minimum expenditure of fuel. A further object is to improve the construction of the speed governor, which is especially adapted to actuate the governing valve. Other objects and advantages of the invention, and the novel features thereof, are pointed out in a series of "claims"—fourteen in number.

Gas Regulators or Valves.—Mills, B. J. B.; a communication from "Air-Fire" Company, of New York. No. 10,086; May 4, 1903.

This is a regulator that can be applied to, and form part of, any kind of burner, and is particularly intended to regulate the quantity of gas, and not the pressure. It comprises two elements—a tubular stem connected with the gas supply-pipe and having a closed upper end, and a thimble rotatably mounted on the tubular stem; both parts being provided in their ends with openings so arranged that they will register and permit the passage of gas to the place of ignition when the thimble is rotated. By providing an axial opening through the tubular stem and thimble, a constant minimum flow of gas is maintained; and by reason of the relative adjustment of the corresponding openings surrounding the axial opening, the quantity of gas to be consumed can be regulated between the minimum and maximum points.



The construction and arrangement of parts of the burner are shown in the section of the complete fitting and a vertical section of the regulator on a larger scale.

Threaded to the gas supply-pipe is a cap having integrally-formed therewith (but of less diameter) an upwardly projecting tubular stem, which is closed at the top to form a seat for a thimble. The external surface of the stem is smoothly finished to permit the thimble (the interior surface of which is also smoothly finished) to snugly fit over and form a gas-tight connection. Under the thimble is a circumferential groove, into which a screw is projected, and by means of which the thimble is securely held on the tubular stem in the desired adjusted position. The upper ends of the tubular stem and thimble are provided with axial openings, through which a constant flow of gas is maintained when the supply-pipe is open. Arranged around the openings in the tubular stem are openings adapted to register with similar openings in the top of the thimble, so that when the thimble is rotated on the tubular stem the openings can be made to register or partly register, or they can be wholly closed and gas admitted only through the axial openings. This relative adjustment of the openings and the constant axial opening will permit a regulation of the quantity of gas to be admitted to the burner, wherein there will be a predetermined minimum and maximum flow of gas with a varying condition between the minimum and maximum.

APPLICATIONS FOR LETTERS PATENT.

14,420.—Moon, J. C. & F. C., "Tiles or bricks for use in regenera tive furnaces." June 29.

14,507.—Stierli, F., "Self-lighting gas-burners." June 30.

14,529.—Smith, L. L., "Generating and burning gas, and utilizing the heat thereof." June 30.

14,559.—Korff, M., "Improvements in illuminating bodies." June 30.

14,611.—Williams, R. A., "Automatically regulating the supply of coal for gas-retorts." July 1.

14,619.—Rowbotham, W., "Gas and like engines." July 1.

14,689.—Reid, J., "Light reflecting means for lamps." July 1.

14,712.—Lawton, J., "Gas-burners." July 2.

14,726.—Tangyes, Ltd., and Robson, J., jun., "Internal combustion engines." July 2.

14,808.—Gibbons, W. P. & G. B. A., Masters, E., and Gay, R., "Discharging gas-retorts," July 3.

14,818.—Boult, A. J., "Gas cooking or heating stoves." A communication from Hildesheimer Sparherd-Fabrik, A. Senking. July 3.

14,838.—Delamarré, H. M. H., "Incandescent gas-lamps for lighting railway trains." July 3.

14,844.—Wilton, G., "Treatment of gases produced in the destructive distillation of coal or other carbonaceous material for the purification thereof and recovery of bye-products." July 3.

14,849.—Schwab, M., and H. Greene and Sons, Ltd., "Manufacture of sulphate of ammonia." July 3.

14,881.—Hodder, H., and Settle, J. A., "Lamps, lanterns, or the like." July 4.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Vertical Gas-Retorts.

Sir,—"——— and there is no new thing under the sun."
(Eccl., chapter I., verse 9.)

The above familiar quotation from the sacred scriptures occurred to me when reading your remarks on "Vertical Gas-Retorts," p. 741 of your June 16 number; also the description of Dr. Bueb's invention on p. 667 of the "Journal" for June 9. Mr. Charles F. Dieterich, formerly Chief Engineer of the Metropolitan Gaslight Company, of New York City, "Cheasapeak," of Baltimore, Md., and other Companies, invented and patented a system of vertical retorts fully twenty years ago, in which the principal distinguishing features were the very ones described by Dr. Bueb. Why Mr. Dieterich did not bring it out, is not known to the writer, who at the time when it was first published thought it surely would revolutionize the method then, as mostly still, in use for making coal gas. Mr. Dieterich is now President of the Union Carbide Company.

If I may venture an opinion, permit me to say that a combination of the Dieterich-Bueb-Settle-Padfield inventions might give the inclined-retort system odds and win "hands down." But, as Andre Coze's successful revival of the inclined retort deserved the plaudits of the whole gas profession, the writer most sincerely hopes that Dr. Bueb also shall reap the full reward, which he already deserves in more than one direction, for his revival of the vertical retort; and that we may yet have *real* "vertical eights," and not only those of the sort so much lauded by a member at the last meeting of the American Gaslight Association in October, 1902, when the "inclines," and especially "yours truly," formed the objective of the well-directed attack by Mr. R. B. Brown, when he told "Why Milwaukee did not Build Inclines," which your readers may remember. What a pity that "Milwaukee" did not wait awhile, and then—but why sigh over what "might have been" *then?*

Morristown, N.J., June 27, 1903. Frederic Egner.

[In view of the statements made by our esteemed correspondent, we are to-day reproducing in our "Technical Record" columns the main portions of the patent specification of Mr. Dieterich, together with the chief illustrations by which it was accompanied. "Journal" readers will therefore be able to judge for themselves as to the extent to which Mr. Dieterich's invention was an anticipation of Dr. Bueb's arrangement, now being experimented with in Germany.—Ed. J. G. L.]

The Sulphur Purification Question.

Sir,—I gather from the "Editorial Notes" in last Tuesday's "Journal," and from the report of the proceedings before the Committee of the House of Lords respecting the Crystal Palace Bill, that some of the highest technical authorities in the land agree that it is a waste of money to remove the sulphur compounds from gas, as some companies are called upon to do by Act of Parliament, and as some others do to meet the "taste" of their consumers. I am especially interested in this matter, as the following relation will show: About two years ago a huge accumulation of spent lime here led us to experiment with oxide purification. This we did by charging the boxes with half lime and half oxide. When using all lime, the sulphur compounds seldom, if ever, reach 25 grains per 100 cubic feet; but when we were using oxide in the proportion named, it was not uncommon for the gas to contain nearer 40 grains. The alteration in the method of purification, and the consequent increase in the sulphur compounds, was most noticeable by consumers and ourselves. A boiling-ring used in my own house gave off fumes undoubtedly noxious; gas-fires in the offices did likewise; and even the incandescent burners accentuated to a marked degree that peculiar dryness in the nose and throat so characteristic a result of breathing for any length of time in a room where a gas-fire is used. The flavour of the sulphur was also there unmistakably. We, therefore, speedily returned to the use of all lime.

Apart from these incidents connected with the particular alteration in the method of purification alluded to, I have often noticed in other towns in mills and factories containing, perhaps, 200 or 300 burners, a distinct flavour of sulphur, when its compounds present have been something over 30 grains, and the factory hands have frequently complained.

I venture to bring these facts to your notice in the hope of eliciting information on the subject. Our experience in the direction indicated has been such that at the present time the Directors are considering the advisability of putting down extra purifiers to deal with the sulphur compounds (though we are not working under sulphur clauses), so that they may be eliminated to even a greater extent than at present with four ordinary lime purifiers.

Nuneaton, July 9, 1903. George Helps.

Obstructors to Progress in the Gas Industry.

Sir,—In this progressive and competitive age of extreme physical and mental exertion, all are striving to utilize to the very best advantage the products of the works for which they are responsible, and to produce them with as little cost as possible, so as to enable gas to compete with electricity. But if this be so under present adverse conditions—that is, supplying gas having an illuminating power of from 15 to 20 candles—what would be the result if the parliamentary clauses necessitating this were obliterated, and gas could be supplied of calorific instead of candle power? For, after all, gas is only, and can only be, used for three purposes—viz., lighting, heating, and power. Why, then, should the undertakers be compelled to supply gas of high illuminating power for the sake of the few consumers who insist upon

using flat-flame burners, and are reluctant to progress? If it were not for this minority, it might be a case of "Down with candles, and up with calories." This is a world of change and progress. Why should it not be? Why should the hopes and endeavours of men of science and research, who have devoted so much of their time for the benefit and advancement of the gas industry, be blasted? But it will certainly not be for long; for improvement, progress, and efficiency are bound to prevail.

It is indeed appalling to be compelled to admit that those who are so reluctant to go forward are totally ignorant on matters concerning the all-important subject which is now occupying the minds of so many of those who are responsible for the progress and efficiency of the gas industry as a whole. We read the decision of the Lords Committee on the Crystal Palace Gas Company's Bill. The result shows how manifestly ignorant those noble lords are of the facts and circumstances connected with the Bill, and of the results desired to be achieved by it, of which they appear to care little, either one way or the other. But it always has been, and perhaps always will be, that whenever any revolutionary scheme, or any great mechanical achievement, is promulgated for the improvement and the general convenience of the people, it is received with sneering pessimism by those whom it will benefit most.

HARRY SCOTT.

Barnoldswick, July 10, 1903.

The Affairs of the Plymouth Gas Company.

SIR,—I attended the annual meeting of the Plymouth Gas Company on the 25th ult., as a shareholder, and because I criticized the management and balance-sheet, I was treated in what I regard as a most disgraceful manner by the few shareholders who were there; and because I referred to the report of the meeting in 1902 (when I was unable to attend), Mr. Bellamy, the Chairman, ruled me out of order. May I therefore in the columns of the "JOURNAL" call attention to the way the affairs of this once exceptionally well-managed Company are conducted.

Knowing as I do the whole history of the Company, and the change of policy since my father retired in 1890 (he held the appointment of Engineer and Manager for over 35 years), I have abstained from criticizing from time to time the doings of the late Chairman, Mr. George Henderson, out of regard for the interest of the shareholders and others, as I knew well the power he possessed with the Directors. But when he retired, and Mr. Bellamy was appointed Chairman, most people thought the old successful policy would be restored. He, however, makes invidious comparisons with the former management; so I feel it my duty, both to the past Directors and to my father, that the other side should be stated.

At last year's meeting, Mr. Bellamy said it was curious to observe that from 1889 to 1899, with the exception of 1894 and 1895, practically they did not earn their dividends, but took a little from the revenue account. My answer is this. The late Engineer (my father) retired in 1890; and the deficit for that year was £1718. The cause of this was due, as stated in the Directors' report, as follows: "The disturbed condition of the labour market has been a source of great anxiety to your Directors, and has resulted in a large increase of wages combined with shorter hours of work. This, together with the advanced price of coals and other materials, adds considerably to the cost of production, and indefinitely postpones the prospect of any further reduction in the price of gas." I must also explain that in past years nothing was charged to capital for mains, services, and meters, &c. So, instead of a loss in 1890, it would be a profit. The balance of profit and loss in 1890 was £26,278; in 1900, it was £15,622—a loss in ten years of £10,622.

The Chairman also stated that the increase in gas sold was astonishing; that in 1882 it was 325 millions, in 1892 it was 585 millions, and in 1902 it was 873 millions. The increase from 1882 to 1892 was 44 per cent.; from 1892 to 1902, it was 32 per cent. Many gas-works could show an increase of more than 100 per cent. in ten years. Neath (a medium-sized town) shows an increase in the last ten years of over 132 per cent. Where then does the astonishment come in?

Another remark: In 1892, it cost 6·991d. per 1000 cubic feet to manufacture gas, but now it was 4·745d. The explanation is this: In 1892, carburetted water gas was not made; but now over 40 per cent. is made. All engineers know that the labour in producing water gas per 1000 cubic feet is very much less than the ordinary manufacture; and as the Plymouth percentage is higher than most towns which have adopted water gas, I consider the difference of 2·246d per cent. is unsatisfactory.

The remarks on naphthalene were misleading, as the impression made was that the Plymouth Gas Company had solved this difficult problem, and that the process was entirely their own. This is not so. The process employed is the one patented by Messrs. Young and Glover, who would be pleased to supply it to anyone by paying for it. We in Neath are not troubled with naphthalene.

The Directors say they have made very satisfactory coal and oil contracts. The Chairman and Secretary used to go to the North once a year to buy coal; now I believe two Directors go. Why do they not advertise, and invite tenders; and, as Mr. Hoyte is a chemist, let him test the different samples and report. The Directors will then be able to make satisfactory contracts.

My next criticism was as to the appalling increase in the capital expenditure. I stated that the capital employed when my father retired in 1890 was £95,000, which works out at 3s. 9d. per 1000 cubic feet of gas sold. In 1902, the capital employed was £332,655, or 7s. 6d. per 1000 cubic feet of gas sold—exactly double. Now take the average capital employed in ten similar works. In 1890, it was about 10s. 6d. per 1000 cubic feet sold; and in 1902, 9s. 6d.—a decrease, although many thousands have been expended during the period in extensions to meet the growing consumption.

Another comparison: In the years 1895 and 1896, when all the up-to-date plant was in full swing, I calculated the loss in working results as compared with the old system to be at least £11,000, after allowing for the saving in wages for carbonizing and coke in the fuel account. Mr. Townsend (who succeeded my father) sold more than 10,200 cubic feet of gas per ton; and the make was over 11,000 cubic feet. He also made considerably over 1 per cent. on the manufacture of sulphate of ammonia. In previous years, the gas sold was over 10,000 cubic feet per ton and over 1 per cent. in the make of sulphate. But when the new system was established, and with everything up to date, the make of gas fell to 10,100 cubic feet per ton, and the gas sold to 9400 feet, with the same coal.

The cause of what I regard as the reckless expenditure of capital and loss in working results, in my opinion, was due to the late Chairman throwing the whole of the management (when Mr. Townsend retired) into the hands of contracting engineers, who had *carte blanche* to do what they thought proper.

In conclusion, let me add that if the Plymouth Gas Company could supply gas at 1s. 9d. per 1000 cubic feet in the year 1888, I consider that the price now should be at least 1s. 6d.; and this it would have been, I believe, if the old successful management had been continued.

ROBT. A. BROWNING.

Neath, July 4, 1903.

Municipal Trading at Sheffield.

A legal correspondent sends us the following observations on the above subject:—

The aggressiveness of modern Progressivists (?) in municipal trading is well illustrated in some facts disclosed in the proceedings on the Sheffield Corporation (General Powers) Bill before the Police and Sanitary Committee of the House of Commons, some features of which were noticed in the "JOURNAL" for the 30th ult. You do not usually concern yourself with local politics, nor would it be within your function to connect any relation between a progressivist majority on a municipal corporation and trading acts which are not only illegal but conducted at a loss resulting in a benefit to a particular class of poor builders. One of this class, a witness for the petitioners (the electrical contractors of Sheffield), was prepared to prove that the Corporation Wiring Department had accepted contracts for wiring newly-erected houses at £5 apiece, with about 20 lights for each house. Another witness was prepared to prove that the Corporation had undertaken work at less than 7s. 4d. per point—the figure quoted by the firm of which witness was a member. It would also be proved by witnesses that the Corporation had actually been touting for petty bell work, and that a contract of this class had been carried out at a place some 16 miles beyond the city boundary. There was also evidence to show that the Wiring Department had done its utmost to obtain the work of wiring the premises of all prospective consumers. The department is, of course, in a specially advantageous position to do this, inasmuch as all intending consumers are obliged, under the Electric Lighting Acts of 1882 and 1888, to notify the undertakers of their intention to take current, and of the maximum power likely to be required. It is evident that in this position the Corporation would be able to underbid the independent contractors, as their quotations would probably be obtained from the consumer. Electricity supply undertakers are in a position to put consumers to great inconvenience when the wiring and fitting work is executed by an independent contractor, as they insist upon very strict compliance with the rules as to insulation, resistance of installation, &c. Further, if the intending consumers are beyond the minimum distance within which the undertakers must furnish a supply of current, the latter can put them and the contractors to considerable trouble and inconvenience—in fact, refuse to supply unless the consumers comply with their terms.

Apart from the economic problem of industrial freedom, another question arises as to legality. It has always been understood that Sheffield was a corporate body having limited powers in commercial enterprise. As far as electricity is concerned, these powers are circumscribed by the 1882 and 1888 Acts, and the Sheffield Electric Lighting Provisional Order obtained by a local Company in 1892, and transferred to the Corporation in 1898. These Acts and Order do not authorize the Corporation to do wiring work, or give them the power to let motors or fittings on hire. These restrictions the Corporation have cavalierly disregarded. Clause 26 of the General Powers Bill was so loosely drawn as to cover the past illegality of the Corporation; but, fortunately, the contractors presented a petition, and retained Mr. R. P. Blennerhassett, K.C., and Mr. M. O'Sullivan, LL.B., who strenuously opposed any retrospective indemnity. The clause, as already pointed out, was finally cut down to one enabling the Corporation to supply electric motors, cooking, heating, and ventilating apparatus on hire.

To return to the wiring, it need not be mentioned to anyone connected with the trade that a charge of 7s. 4d. per point for light-wiring could not be remunerative. The charge for labour alone would be 4s. 6d. a point, to which has to be added the cost of the wires, fittings, lamps, &c. It was admitted, in an interview between the head of the Wiring Department and a witness, that the Corporation had made a loss of about £5 upon the above charge of £5 a house of 20 lamps. There were 14 petitioners opposing the Bill. These were the entire electrical engineering firms of Sheffield, who have had to combine against municipal aggressiveness. The Sheffield Chamber of Commerce had passed a resolution in favour of the position taken up by the contractors, and urging the Committee not to grant any powers more extensive than those set out in the clause inserted in the Brighton Act of 1901. This clause specifically excludes the Corporation from undertaking any class of wiring work, but enables them to supply motors or fittings on hire. It would have been an instructive point for discovery on the cross-examination of the Lord Mayor, aldermen, and councillors of this distinguished city, to find out on what principle (if any) the specifications, advertisements, and invitations to tender were conducted, and to ascertain out of what moneys the capital necessary for carrying on this department has been obtained, especially as, under the provisions of the Electric Lighting Acts and the Public Health Acts, the Corporation are bound to keep separate accounts of their Electricity Supply Department. There was some evidence to show that the department did not allow any establishment charges;

and in this way, of course, they would be in a fictitiously more favourable position to underbid the poor suppliers.

The compromise effected between the contending parties was evidence of a guilty conscience (assuming they have any) on the part of the Corporation as to the methods of tendering, unauthorized supplies of motors and fittings, &c. The aim of the Legislature in authorizing municipal bodies to go into the electric lighting trade was not to carry on competition in an un-English manner. The Corporation of Sheffield have been hitting below the belt; and, in order to ward off a counter attack, they have made a hole-and-corner compromise, after briefing Counsel and wasting the money of the ratepayers. Matters will not rest where they are. The contractors are applying for an injunction in the Chancery Division of the High Court of Justice to restrain the Corporation from continuing their high-handed proceedings. They have no authority to carry on wiring work, as this was expressly excluded in the compromise, on similar lines to the Brighton clause. In the recent Barnstaple case, it was decided that a corporation supplying electricity under a Provisional Order have no authority to undertake any class of work but the supply of current. Parliament has never allowed such an extension of powers as those arrogated by the Sheffield Council; and not until the Select Committee now sitting have reported in favour of Municipal Socialism can we expect to see this extension of authority. But before this takes place, the whole battle of Socialism *versus* Individualism will have to be fought out and won.

PARLIAMENTARY INTELLIGENCE.

GLEANINGS FROM THE COMMITTEE ROOMS.

THE features of the past week's proceedings are few but important; and they bring us appreciably nearer the end of all that will be found of interest in respect of gas and water legislation this session. To summarize what is referred to more fully in the succeeding paragraphs, it will be found that a small part of the Crystal Palace Gas Bill has been carried forward another step, but that is to be its last, the Gas Department of the Birmingham Corporation have lost their Erdington works scheme, there are two gains in respect to the imposition of a compensation clause for gas companies in connection with electrical damage, but the Bermondsey clause while gained in one application for it during the week has been lost in another. The Derby Gas Company's Bill was before the Unopposed Committee of the Commons on Friday; and the North-Western Electricity and Power Gas Bill was down for second reading yesterday. We shall, therefore (as opposition is to be prosecuted in the Commons), see the latter in Committee shortly. With regard to the Derby Bill, the fact may be recalled that it possesses quite a distinguished character. It consolidates the stock, gives the Company considerable new capital powers, fixes the standard price with a neutral zone, reduces the illuminating power of the gas to 14 candles, prescribes the Wandsworth burner for testing, allows an increase of sulphur compounds from 20 to 25 grains, with a six days' average, and specifies that testing for illuminating power and quality is to be on week days only. All these and other matters were particularized in the "JOURNAL" for May 19 (p. 456); and they are worthy of the special attention of other gas companies who have under consideration an early application to Parliament. The Directors, their Engineer (Mr. J. Ferguson Bell), and the Engineers who advised them (Sir George Livesey and Mr. Charles Hunt) are highly gratified with the success of this application.

The Crystal Palace Gas Bill.

The announcement in last week's notes that this Bill would be withdrawn was made, as was then indicated, on the authority of Sir George Livesey; but it was astonishing to find on Wednesday morning that a remnant of it was to be carried through the Committee stage. Representatives of the parties (but not Sir George) were in attendance at the opening of the sitting of Lord Herries' Committee that day, when Lord Robert Cecil announced that it had been concluded (it was not stated by whom) that the best course would be to withdraw all the clauses opposed by the London County Council, and so much of the preamble as related thereto. This removed from the Bill the clauses dealing with the illuminating power of the gas, the standard price, the free distribution of suitable burners for the proposed lower power gas, and all the provisions as to the testing of gas and the establishment of a new testing-station in Lewisham. The question of purification, of course, remained as at present. The remnant of the Bill dealt with such matters as the purchase of additional land, the extinguishing of a right-of-way across the Company's works, and the provision of a roadway in substitution. Further powers, too, were proposed to be conferred as to the sale of unissued stock to the consumers and the employees of the Company; and provision was made as to the representation of the latter on the Board. After the statement by Lord Robert as to the removal of the clauses referring to the illuminating power and other matters, it was agreed that certain amendments as to the land the Company propose to acquire and the making of a new road should be submitted to the Committee before the end of the sitting in the afternoon. The revised clauses had really no general interest; the amendments merely alluding to an arrangement for an increased widening of the road, the question of the payment involved, and provision for the reference of the payments to an Arbitrator if necessary. Furthermore, the Company were not to erect, without the consent of the County Council, any building beyond the building-line. Sir George Livesey informs us that the statement made last week, that the Bill is to be withdrawn, is absolutely correct.

Defeats in Second Committees.

Such a rapid succession of collapses of important gas schemes in the second Committee stage of Bills as we have had this session, has not been the experience for some years; and these opposition successes will, without doubt, have an influence in creating a desire in future to persist in challenging measures when antagonistic petitioners do not get a favourable response to their requirements in the first Chamber. Last week we had to announce the case of the Walker and Wallsend Gas Company, who had taken from their Bill, after succeeding in safely defending them through the Commons, the clauses which were intended to enable them to acquire the freehold of their present leasehold lands and new lands for further works for additional production, and to give them the means of working more economically. Then came the Crystal Palace Gas Bill, which met with great favour in the Commons, but when submitted to a Committee of noble Lords, they showed, by the very manner in which they delivered their decision, a conspicuous want of knowledge of the subjects upon which they were called to adjudicate, even after the tremendous effort that had been made by the Company to give them the testimony of the highest authorities on the various matters to be dealt with that the country could produce. The only ingenuity the Committee displayed was their "slimness" in foisting upon a Departmental Committee certain responsibilities which form no part of their duties, and which it was quite within their province, or of the Board appointing them, to refuse to accept—assuming, of course, that the Company gave them (which they are not going to do, as seen above) the opportunity of accepting by proceeding with the Bill. The suggestion that the Departmental Committee should prescribe for one Suburban Company and not for others is simply ridiculous. However, in the Crystal Palace case, the whole essence of the Bill was extracted in the second Committee stage by the Committee's feebleness and peculiar notions of their duties. Now there is a third instance, following immediately on the other two, of an opposition being successful where they failed in the first Committee stage; and that is found in the overthrow last Tuesday of the gas section of the Birmingham Corporation Bill.

The Frustration of Birmingham's Gas Scheme.

For this defeat of the gas section of the Birmingham Bill, the disinterested listener to the evidence tendered both for and against the measure must find it hard to find a reason. The object of the measure was explained, with an indication of the trend of the proceedings up to the close of the previous day's sitting, in the "Gleanings" last Tuesday. The proposal of the Corporation was to obtain power to utilize for gas-works purposes the 120 acres of land which they had acquired at Erdington. They had established their case in the Lords; and their evidence on this occasion was again obtained from witnesses distinguished for their eminence in the gas profession. The opposition was founded entirely on hypothesis; it being supposed that the contemplated gas-works would cause very grave and insufferable offence to the residents in the locality—far more intolerable and harmful than the extensive sewage farm which they have in the district, and on to which the sewage of populous Birmingham is poured. The supposed nuisance, and nothing more, appealed sufficiently to the Police and Sanitary Regulations Committee of the House of Commons to reject a scheme which would have contributed largely to the development of Erdington and added greatly to the revenue of the district. Even now there is nothing to prevent the Corporation selling or letting the land for far more offensive operations than those of a gas-works, and for the carrying on of which statutory powers would not be required. However, the local evidence for the petitioners against the measure was continued on Tuesday morning; and the more that was given, the more palpable was it that the source of the real opposition was small. Throughout the proceedings, the Corporation did their utmost to show their willingness to do everything possible to so order and conduct the new works that there should be the minimum of offence. They even went to the length of falling in with a suggestion of one of their own witnesses—Sir George Livesey, we believe it was—that on the frontage of the site, for a width of 100 yards, no works for the manufacture of gas should be placed, but that the strip of land should be utilized for houses to accommodate the men engaged on the works and their families. Moreover, behind this wide strip of land the promoters were prepared to construct the gas-holders, and to put the retort-houses down in the neighbourhood of the canal on the opposite side of the site. But this was all of no avail. The anxious and careful consideration that has been given over several years to the question of this new gas-works scheme, endorsed as it was by eminent gas engineers, was rendered futile in a few minutes' private consultation by five members of Parliament, whose unanimous determination was that the preamble of the Bill, so far as it related to the use of the site for gas-producing purposes, was not proved.

A Question of Compensation.

We are not altogether sure that Mr. Richards—who has developed a small estate known as "The Rookery" at Erdington, for the purpose of fruit-growing as a business, and who was the only opponent to the Birmingham Bill other than the District Council—desired to see the overthrow of the Bill; his aim appeared to be the realizing of some extraordinarily favourable terms in respect of compensation for damage to his property and business. A little discussion on the point that arose between Mr. Blennerhassett, K.C., and the Committee is worth special note. It was pointed out by learned Counsel that a great cloud had been thrown around the question of compensation by confusing compensation under the Lands Clauses Act with the compensation which everybody who is injured is entitled to receive under the existing law. Upon this the Chairman inquired whether, if the preamble of the Bill was passed, Mr. Blennerhassett suggested that Mr. Richards would be entitled to compensation, which, of course, Counsel did not. The natural reply was that Mr. Richards's right, under the common law, would be unimpaired; and, under section 9 of the Gas-Works Clauses Act, 1871, which was expressly incorporated in the Bill, he could take proceedings for nuisance in the event of nuisance being caused. Another member of the Committee—Mr. Corrie Grant, himself a lawyer—apparently fancying that Mr. Blennerhassett had not grasped the import of the Chairman's inquiry, put the matter in yet

another way: Suppose, he said, by the introduction of the gas undertaking on this site, Mr. Richards's property is depreciated without any nuisance being caused, he then has no claim to compensation? to which Mr. Blennerhassett responded again that Mr. Richards would be in the same position as everybody else. The discussion was continued; but it threw no new light on the situation. It was clear that Mr. Richards desired to be put in a position which no other property owner enjoys; and Counsel urged that one of the principles always followed by Select Committees is not to vary the general law in favour of an individual. No precedent favourable to Mr. Richards was unearthed by the discussion.

Compensation for Electrical Damage—An Excellent Week's Work.

The good advice that has been tendered on many occasions to gas companies to keep on pegging away for a compensation clause in respect of damage to their mains and pipes arising from electricity distribution systems or tramways is bearing fruit, and better success is attending the efforts of those who have not given up the fight. The Brighton and Hove Gas Company and the Crystal Palace District Gas Company have obtained the insertion of compensation clauses in two Tramway Bills affecting their respective localities. The proof of damage from electrical distribution systems is being accumulated from various quarters; and in the cases of last week, there were gentlemen engaged with some grim examples of the fearful effects of fusion and electrolysis. In the corridors were seen Mr. Joseph Cash, who, as the Engineer of the Brighton Gas Company, had a number of samples in his possession; Mr. Walter Hole came up from Leeds with a specimen of a pipe that had had a particularly bad time in contact with an electric cable; Mr. G. F. L. Foulger, the Distributing Engineer of the Gaslight and Coke Company, had ready, if required, a useful contribution; and Mr. Henry Green, of Preston, was also there (on the Beckenham Bill) with some lengths of pipes to show the powerful deteriorating effect of stray electric currents. In adjoining rooms—over the Brighton and the Beckenham cases—Counsel fought sternly both for and against the insertion of the compensation clause; and evidence was laid at great length before the Committees on both sides. A big effort was made by the promoters of the Bills, as is their custom, to show that the Board of Trade regulations give gas companies ample protection; but the protective power afforded by them is at the best but transient. Even assuming that the work is in the first place faithfully executed in accordance with the regulations, there can be no continued reliance on the work being maintained in its pristine condition. The operations of so many different occupants of the subsoil of the streets soon have the effect of altering the conditions of things; and, on this point, Mr. Foulger could tell a convincing tale of experiences in London—of, for instance, cables laid precisely in accordance with the regulations being, through later operations, found resting directly on the top of gas-mains. How comes it, too, if the regulations are sufficient, that the accumulation of samples of electrical damage is growing? Mr. Balfour Browne says that these are the results of careless work, to which the rejoinder may be made that the "careless work" shows that the Board of Trade regulations are not complied with in all cases. Mr. Baggallay holds that the gas companies should go to the Board of Trade—the proper "expert" authority—with their proofs of damage. The gas companies at present prefer the quick procedure of the Parliamentary Committees to the slow, lumbering movements of the Board of Trade. It will take no end of time to work the Board up to a recognition of the very real seriousness of this matter; and the Gas Companies cannot afford to lose that time. With this, two Lords' Committees, by their decisions, agreed last week; and their verdict is an expression of their opinion as to the deficiency of the regulations, and as to gas companies being justly entitled to compensation in the event of damage. In the Brighton case, the Committee inserted this clause: "If at any time it be proved that any injury or damage to any mains, pipes, or apparatus of the Brighton and Hove General Gas Company shall have resulted from the use of electric current on any of the tramways authorized by this Act, nothing in this Act shall relieve the Corporation from liability to make compensation for such injury or damage." In the case of the Beckenham Bill, the Committee sitting in the next room adopted the same clause; but they preferred, for what reason is not apparent, to alter the portion of it that refers to electric current by words to make it clear that the damage is due to "electrolysis." Messrs. Blyth, Dutton, Hartley, and Blyth, the Solicitors for the Crystal Palace District Gas Company, have sent us a copy of the clause as it will appear in the Act. It reads: "If at any time it be proved that any injury or damage to any mains, pipes, or apparatus of the Crystal Palace District Gas Company shall have resulted from electrolysis resulting from the use of electric current, or any of the tramways authorized by this Act, nothing in this Act shall relieve the Council from liability to make compensation for such injury or damage." Their Lordships, in this instance, had some mysterious liking for the term "electrolysis;" but without it the Brighton clause seems to have a broader application. However, the week is one of the brightest and most hopeful that we have had this session in connection with this particular compensation question for gas companies.

B.-B. and the Bermondsey Clause.

If Mr. Balfour Browne is not for you in asking for the Bermondsey Clause, then abandon hope of getting it if he is against you. This gifted leader at the Parliamentary Bar has had heaped upon him no end of glory for the wisdom, skill, and eloquence he has displayed in connection with the introduction of this clause in Bills and Orders in which local authorities have been taking new powers for trading in electricity. Certainly five or six cases in which the clause has obtained adoption in this and last session may be traced to Mr. Balfour Browne's influence and advocacy. Last week, however, as the leader for the Beckenham District Council Bill referred to above, he had to oppose the application of the Crystal Palace District Gas Company (for whom Lord Robert Cecil and Mr. Rostron were appearing) for the insertion of the clause in the electric lighting portion of the measure. After the eloquent manner in which Mr. Balfour Browne has appealed for the clause on previous occasions, such statements as those made last Thursday afternoon in this Beckenham case gave the listener to his former arguments a bit of a shock. How are these for examples: "Why this Gas Company should be given a clause which would preclude them from the possibility of loss and yet give them the benefit of the profit, I do not know." "This is an exceptional case." "The clause has been put in [in previous cases] without due consideration of the very serious principles involved," How dreadful! The statements are odd-looking coming from the man who has fathered the clause up to his present appearance in opposition to it. Of course, this kind of thing merely arises from the changed circumstances in which a leader of Mr. Balfour Browne's standing finds himself from day to day and even from hour to hour during the Committee sittings. However, he succeeded in persuading this particular Lords Committee that the Gas Companies were not entitled to the clause. Eight days before he carried a Commons Committee with him when he declared that, while gas companies had no right to stand in the way of legitimate competition, they were "entitled to justice" in respect of rate-aided competition. Why were not the Gas Company in the Beckenham district? The Brighton Gas Company had justice done them in the next room.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bill brought from the Commons, read the first time, and referred to the Examiners: Sheffield Corporation Bill.

Bills reported: Broadstairs Gas Bill, Broughty Ferry Gas Provisional Order Confirmation Bill, Leigh Corporation Bill, Newcastle-upon-Tyne Electric Supply Bill, Walker and Wallsend Union Gas Bill.

Bills read the third time and passed: Broadstairs Gas Bill, Broughty Ferry Gas Provisional Order Confirmation Bill, Bury and District Joint Water Board Bill, Hyde Corporation Bill, Leigh Corporation Bill, Merthyr Tydfil Urban District Council Bill.

The Ebbw Vale Water and Improvement Bill has been referred to a Select Committee, consisting of Lord Herries (Chairman), Earl Waldegrave, the Earl of Powis, Lord Kilmaine, and Lord Lyveden, who commenced their sittings yesterday.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Bill brought from the Lords, read the first time, and referred to the Examiners: Bury and District Joint Water Board Bill.

Lords Bills read a second time and committed: Bournemouth Gas and Water Bill, Bradford Corporation Bill, Water Orders Confirmation Bill.

Lords Bills reported: Birmingham Corporation Bill, Derby Gas Bill.

Bills read the third time and passed: Hexham Gas Bill [Lords], Nantwich Urban District Council Bill [Lords], Sheffield Corporation Bill, Torquay Corporation Water Bill [Lords].

The North-Western Electricity and Power-Gas Bill [Lords] has been referred to a Select Committee, consisting of Sir F. Godson (Chairman), Mr. W. Jones, Mr. Nicholson, and Mr. M'Kean; to meet to-morrow.

HOUSE OF LORDS COMMITTEE.

Wednesday, July 8.

(*Before Lord* HERRIES, *Chairman, Lord* STRATHSPEY, *Lord* ST. OSWALD, *and Lord* BRAYE.)

CRYSTAL PALACE DISTRICT GAS BILL.

The Committee met to-day for the purpose of considering clauses.

Lord R. CECIL, on the Committee assembling, said: We have had to consider your Lordships' decision very carefully; and I think it practically amounts to a decision that the suggestions we put forward did not meet with the approval of the Committee. Therefore we think the best course will be to withdraw the clauses which were opposed by the County Council, and so much of the preamble as relates thereto. The clauses are Nos. 9, 10, 11, and 12. [These clauses relate to the illuminating power and standard price under the sliding-scale; to the supply by the Company of suitable burners, gratis, in lieu of those in use; to the new provisions as to testing gas; and to the establishment of a new testing-place in Lewisham.]

Mr. CRIPPS, the Parliamentary Agent for the promoters, then proceeded to go through the clauses. On clause 4, which gives power to take additional lands, Mr. Freeman brought up some new sub-sections; and, in order to give the Company time to consider them, the further proceedings were adjourned till the afternoon.

Subsequently, the new sub-sections were discussed; and ultimately provisions were inserted giving the London County Council power, in respect to certain land at Southend Lane, Lewisham, proposed to be acquired by the Company, to require the setting-back of the boundary fence or wall of the land to such a distance as to make the highway 50 feet wide—the expense to be borne by the Council; the terms, failing agreement, to be settled by an Arbitrator appointed by the President of the Institution of Civil Engineers.

The Bill, as amended, was ordered to be reported to the House for third reading.

HOUSE OF LORDS COMMITTEE.

July 7, 8, and 9.

(*The* DUKE OF BEDFORD, *Chairman.*)

BECKENHAM URBAN DISTRICT COUNCIL BILL.

This was a Bill under which authority was sought by the Council to make further provision with regard to their electrical undertaking, and to construct certain tramways; an agreement being scheduled to the Bill by which, when constructed, the lines are to be leased to the British Electric Traction Company. In the result, the Committee found the preamble proved.

Counsel for the Bill were Mr. BALFOUR BROWNE, K.C., the Hon. J. D. FITZGERALD, K.C., and Mr. VESEY KNOX; while Lord R. CECIL, K.C., and Mr. ROSTRON appeared for the Crystal Palace District Gas Company and for the Bromley Gas Consumers' Company, who petitioned in opposition. Objection to the Bill was also taken by the London County Council and by the South-Eastern and Chatham Railway Company's Managing Committee.

Mr. BALFOUR BROWNE proceeded to deal with the petitions presented by the two Gas Companies; the first point raised being as to electrolytic damage to their pipes, which they feared the working of the tramways would cause. This matter had been discussed for a great many years, and a Joint Committee presided over by Lord Cross held an inquiry in regard to it, at which the gas, water, and railway companies were represented. That Committee came to the conclusion that certain protection was necessary A Model Clause was therefore drawn up for the express purpose of preventing electrolytic action; and it was inserted in the present Bill. He read the clause, and explained its various provisions, pointing out the importance of the subsection which said: "The electrical power shall be used only in accordance with the Board of Trade regulations; and in such regulations provision shall be made for preventing fusion or injurious electrolytic action of or on gas or water pipes or other metallic pipes, structures, or substances, and for minimizing, as far as is reasonably practicable, injurious interference with the electric wires, lines, and apparatus of other parties, and the current therein, whether such lines do or do not use the earth as a return." Under this provision, the Board of Trade had made very stringent regulations, which, if carried out, as a fact, did prevent all electrolytic action or fusion. The Joint Committee said the Board of Trade were to make regulations. Those regulations had been made; and he therefore asked the Committee not to listen to these two Companies, who wanted something more.

Lord R. CECIL: We do not want that; we want exactly what was given in the next room in the Brighton case.

Mr. BALFOUR BROWNE said the Brighton case did not bear on this case at all. Continuing, he urged that protection against damage should not be given to an individual gas company which gas companies generally were not afforded. This demand arose out of careless management at Leeds. There the whole of the gas, water, and electric mains were in the hands of the Corporation; so that if they were doing any damage at all, it would affect their own property. No doubt the Gas Companies would be able to state that at Leeds certain electrolytic action had taken place. But that had nothing to do with it. The promoters would like to know whether the Corporation there were working under the Board of Trade regulations, and why, if the Companies proved their case, the Board of Trade could not make regulations to prevent the damage. Instead of going to the proper constituted authority, they came to the Committee and asked them to decide this nice question. The principle of the general law was that if a thing authorized by the Legislature was done without negligence, even if it caused damage, there was no liability to an action. But in this case, the Gas Companies sought to impose an obligation to pay damages, even though reasonable precautions were taken and there was no negligence. This was absolutely altering the general law. The Model Clause gave the Board of Trade full power to protect the Gas Companies; and if they feared that they would be damaged, they should go to the Board of Trade. The Gas Companies also took exception to clause 157, under which the Council sought power to supply electric fittings. It was the custom of the Gas Companies themselves to supply fittings; and in at least 22 cases, which Counsel enumerated, the clause in question had been inserted, The objection was that, if the Council supplied electric fittings. the Gas Companies would trade at a great disadvantage as compared with the Council. Inasmuch, however, as the Companies themselves supplied fittings, there would be absolute equality in the competition. The Companies asked for the insertion of the Bermondsey clause. The object was to make the price of electricity high, and to prevent an electric corporation competing with them. But that was not the object of Parliament. Parliament intended that there should be competition, and that it should be perfectly fair; and he maintained that, under the present Bill, the competition would be fair. If there was a profit on the undertaking, the benefit would go to the whole of the ratepayers, including the Gas Companies. If there was a loss, the Gas Companies should bear it with the rest of the ratepayers. Why they should be given a clause which would preclude them from the possibility of loss, and yet give them the benefit of the profit, he did not know.

Mr. *Stephen Sellon*, the Chief Engineer to the British Electric Traction Company, gave evidence in support of Counsel's statement, and explained that the regulations which the Board of Trade had made in regard to electrolysis had from time to time been altered as experience had proved that additions could be made without imposing a large amount of extra expenditure upon the undertakers. The effect of these regulations was to reduce the leakage of electricity to such an extent that it was held by those advising the Board of Trade that no electrolysis could occur, or, if it did occur, it was so little that the quantity was negligible. His Company worked 50 or 60 undertakings in this country under these regulations; but they had never had a single case of electrolysis brought against them. The gas and water companies had the power to require his Company to give facilities for testing at any point to show if electrolysis was occurring; but there was no record of any such application—showing that, as far as they were concerned, they were quite content with the present position. The clause would be particularly harmful in the present case, although he was satisfied no electrolysis would take place. His Company had undertaken to lease the lines; and if the Committee accepted the Bill with such a clause as was proposed in it, they would have to work them under that serious liability.

In cross-examination by Lord R. CECIL, witness said he did not admit that it had been proved that gas-pipes at Leeds had been injured by electrolysis. The Board of Trade regulations did not pretend to prevent leakage. If, under those regulations, electricity escaped and reached pipes in sufficient quantity, it would, under certain conditions, produce electrolysis. In those circumstances, there was no injustice in the owners of the pipes so affected having the right to require those responsible for electricity to pay the damage, provided the electricity undertakers were relieved of the Board of Trade regulations. He admitted that the current, instead of returning by the rails, might to some extent go to a gas-pipe; and assuming the pipe was not a conductor, it might leak out again, and then the pitting process would commence. Clearly, examination was necessary to know whether damage was going on; but he did not think it could go on for years without discovery, because gas companies had a perfect right to see whether they were being affected or not. It was generally held that a difference of potential of 1·5 volts did not produce any electrolytic action at all, or so slight an action as to be absolutely negligible. The gas companies could call for tests, or test themselves the difference of potential; and if it proved not more than 1·5 volts, then there was no doubt electrolysis was not proceeding. Asked as a crucial question whether there was anything in the Board of Trade regulations to restrict the amount of current flowing through a gas-pipe, witness said they only knew as regards the question of current what they collected at the generating station; but it was easily found out whether there was a large current. It was not necessary to dig up the pipe to test, because it could be done with the connections. The harm the clause would do him would be that if he commenced working under it, there might be pipes in the ground which had been there for 15 years, probably seriously corroded already from the action of the earth—especially in some cases where pipes rotted through in five or six years; and the gas company would then take up a pipe and say "This is corroded; it is not the ordinary action of the earth, but it is due to electrolytic action," which cannot be proved except by a very difficult process. The gas company would then bring an action; and his Company would be in a continual state of litigation from the time of starting till they became bankrupt. Asked whether, if the gas company failed to prove that the damage was electrolytic, his Company could not recover costs, he said he had been in some lawsuits himself, but had never recovered all his costs. With respect to the insulated metallic return, there was still danger of electrolysis; but it was certainly reduced. He did not say that return could not be put commercially upon tramway companies. The London County Council, for instance, were using the conduit and the metallic return. This was possible in London, because the traffic was enormous, and could bear the cost. But in poorer districts, where it was necessary to use the overhead system, it was explained to the Joint Committee that it was not reasonable to ask that insulated returns should be used.

In re-examination by Mr. VESEY KNOX, witness said it was only fair that a tramway company should have as much protection as a gas company against vexatious actions. Gas companies found difficulty in preventing leakage from their pipes due to bad joints and other causes; but they were not liable unless it was shown they were negligent. He did not see why a tramway company should not be allowed leakage to a certain amount, regulated by the Board of Trade, when gas companies were.

Mr. *B. Hopkinson*, examined by Mr. VESEY KNOX, said his firm had acted for five years as Consulting Engineers to the Leeds Corporation Tramways. The system, one of the biggest in the country, had been working since 1897; and no suggestion of electrolysis had been made until about two months ago, when a pipe was found having two holes in it alleged to have been caused by electrolysis. This had not been proved to the satisfaction of the Corporation, who owned both the tramways and the pipe. A Special Committee had been appointed to investigate; but no conclusion had been arrived at. If the cause were due to electrolytic action, the next thing to be considered would be were the Board of Trade regulations being observed. Referring to some electric lighting cables taken out in Whitehaven, witness said, in this case, electrolysis was caused by a small pin hole in the lead casing, which was not very well constructed. The current escaped and corroded the lead of the cable; so that the electric light people, the owners of the cable, were really eating their own mains. In his opinion, it might be a question almost impossible of solution in most cases to know where the electricity came from that did the damage.

Mr. *Henry M. Sayers* said he had had the electrical work to do in connection with the large system of tramways owned by the British Electric Traction Company. He had watched all the Company's lines very carefully in regard to electrolysis. It was his opinion that, under the Board of Trade regulations, fully observed, no electrolytic action could occur. This was his experience; and his opinion was founded chiefly upon experience. They had had lines working now for ten years, and one or two under the very elementary regulations of 1892. He had examined the pipes which had been placed at various places where he had thought damage might occur, and he had examined the tramway rails at the points where they would have the largest potentials positive to the soil. The corrosion of the rails was not more than in any rails used for a like time; and therefore his experience went to show that, under actual practical conditions, electrolysis did not take place in the soil in the same way as it did in a solution. This practical experience was borne out by theoretical investigations by Messrs. Claude and Herrick, and published in the usual scientific channels.

This closed the case for the promoters.

Lord R. CECIL then addressed the Committee for the Crystal Palace District Gas Company. He said his case was that injury had been

caused in spite of the Board of Trade regulations; and he asked the Committee to provide for this case, and to say that the ordinary rule of English law should prevail, and that the person causing the damage should pay for it. He was not asking their Lordships to say whether the Board of Trade regulations were good or bad; but if, in spite of them, damage was caused, he was entitled to the ordinary compensation clause which was always granted where there was substantial danger of injury. There was no better instance to be found than the decision of the Committee last year in the case of the "Tube" Railways. The principle settled in that case he prayed in aid here. It was of no use to refer the gas companies to the Board of Trade; that body could not give them compensation. They could make regulations; but it was conceded that the only regulation that would really protect the pipes would be that the return rails should be completely insulated, which would practically put an end to tramways altogether. He asked their Lordships to grant the clause sought, and so protect them in the only way in which they could be protected.

Mr. *W. Hole*, the Superintendent of the Leeds Corporation Gas-Mains and Distribution Department, examined by Mr. ROSTRON, said he came there as an unwilling witness. Proceeding, he gave evidence as to various gas-pipes taken up in Leeds—in Call Lane and Kirkgate—and found to be damaged presumably by electricity. The Kirkgate pipe was laid in 1897 and taken up in February last. In searching for the escape coming from this pipe, a 14-inch main was found deeply pitted with seven holes in an area of 6 square inches, and varying in depth from $\frac{1}{8}$ inch to $\frac{5}{8}$ inch. There were 20 inches of concrete between the tram rail and the pipe, which was laid in 1875. Near the same spot was a 2-inch service-pipe badly affected, which was laid in 1890. There was also a 4-inch pipe in close proximity, pitted to a depth of $\frac{5}{8}$-inch. He had examined pipes and mains in another part of the city distant from the trams—in one case 1500 yards and in another 300 yards—and found them good, though they had been in for 30 years.

Professor *W. E. Ayrton*, examined by Lord R. CECIL, explained to the Committee how electrolytic damage was caused. He said one or two joints in a pipe might be electrically bad, but good from the point of view of holding the gas. Then the current would leave the pipe, go through the earth, and return to the next length of pipe. It had been doubted whether this jumping of the joints was possible; but experiments he had carried out had shown him it was a fact. To his surprise, he had found that the current which jumped the joint was as large as a third of the current which actually went through the joint. Where the current left the pipe, it made a pit; so that it was a real serious risk to gas-pipes. He thought it possible to distinguish pitting and corrosion due to natural causes from that due to electrolysis.

Mr. *James Swinburne* supported the evidence of Professor Ayrton. He had heard, he said, the evidence given about the current being limited to 2 amperes per mile. That was not really the leakage of current, it was the current taken up by two earthplates; and it really did not follow from it that the current in the pipes was small at all. The Board of Trade regulations did not prevent the current when it got into a pipe causing damage; and as far as he was aware, there was no other way to prevent pipe damage other than by an insulated return, which was certainly commercially impracticable.

The CHAIRMAN intimated that the Committee did not think it necessary to hear the promoters in reply.

The Committee having deliberated,

The CHAIRMAN said: The Committee are of opinion that the Brighton clause should be inserted in the Bill, with this small difference, that, instead of saying "from the use of electrical current," the words should be put in "from electrolysis."

On Part X. of the Bill, enabling the Council to supply electric fittings to the houses of consumers, Mr. Rostron asked the Committee to insert the Bermondsey clause, urging that, although the gas companies did not complain of the competition of electricity, municipalities ought to conduct their undertakings on ordinary commercial principles; and this clause would compel them to pay their way, without drawing upon the rates.

After hearing Counsel, the Committee decided not to insert the clause.

On the further consideration of clauses, the Committee agreed that the substituted words in the electrolysis protective clause should be "electrolysis due to the use of electric current on any of the tramways authorized by this Act."

The Bill, as amended, was ordered for report.

HOUSE OF LORDS COMMITTEE.

Tuesday, July 7.

(*Before Lord* HATHERTON, *Chairman*, *Lord* BELHAVEN, *the Earl of* LYTTON, *the Earl of* DONOUGHMORE, *and Lord* BOLTON.)

BRIGHTON CORPORATION TRAMWAYS BILL.

The Question of Electrolysis.

This Committee, as mentioned last week, resumed their sitting today. After hearing further local evidence, they found the preamble of the Bill proved so far as regarded the tramways remaining in the Bill. They then proceeded to hear the case of the Brighton and Hove General Gas Company with respect to the insertion of a protective clause against damage by electrolysis.

Mr. *Joseph Cash*, the General Manager of the Company, examined by Mr. PADDON, said the Company had about 165 miles of main, of a total value of £120,000, of which £50,000 or £60,000 would be in Brighton. With regard to the tramways, it was the fact that the mains had received injury by fracture at different times. A correspondence had been carried on with the Corporation, who had repudiated liability, although the bulk of the tramways had been laid without any proper notice being given to the Company. Electrolytic action and fusion were distinct—fusion was instantaneous, but electrolysis was the gradual eating away of a pipe, which might take years, but was equally certain in its effects. In the case of meters, the electrolytic action went through in a few days. They had not yet felt anything like the damage they anticipated; and in asking for protection, they were conscious of such protection having been given, because the promoters proposed to distribute power, and were supplying current for electric light. Under such circumstances, there were twelve precedents for the insertion of a clause. They asked for a clause to protect them from the danger of fusion or electrolysis, whether from current for electric lighting, tramways, or power.

In cross-examination by Mr. TALBOT, witness said there was nothing to prevent the Company going to the Board of Trade and asking for further regulations. But they had been challenged to produce instances of damage from electrolysis caused by tramways; and they were there to produce samples.

Mr *A. S. Cooke*, the Chief Inspector of the Company, said in June, 1896, he found that two service-pipes in Ship Street were absolutely destroyed owing to contact with electric cables. [Specimens of the damaged pipes were produced.] The damage was caused by current used for electric lighting. He spoke to the Corporation foreman, who said there had been a strong leakage of current, which had earthed at the gas-service, and had melted it in doing so. There was another case in June, 1897, in East Street; and also one at the Alhambra, both due to similar causes. Four meters had also been rendered leaky by an escape of current at No. 8, Melville Road. The meters became pitted on the cases with brownish spots, which eventually leaked. On the electric service being examined, a portion of the insulating covering was found to be gone; and it was admitted by the Hove Electric Light Company's Manager that the damage was due to electrolysis.

Mr. *Walter Hole*, of the Leeds Corporation Gas-Main Department, said he appeared under an Order of their Lordships' House. He had 908 miles of mains under his supervision. Tramways first ran in Leeds in 1897. In Corn Lane, on February 27 of this year, they found a 1 inch service-pipe deeply pitted by electrolysis, and in Kirkgate a similar pipe eaten through, which was bedded in concrete. In the case of a 14-inch main, which was uncovered when searching for the leak at Kirkgate, within an area of 5 inches there were no less than seven pittings, varying in depth from $\frac{1}{8}$ inch to $\frac{5}{8}$ inch. A 4-inch main in close proximity was also pitted to a depth of $\frac{5}{8}$ inch. In searching for an escape of gas in Glasshouse Street, they found a $\frac{3}{4}$-inch pipe eaten quite through. It was a fact that at a certain spot in Leeds over which the tramways pass blue flames were a few days ago seen issuing from the pavement, and a small boy venturing near had his boots burned and received a severe electric shock. In the case of pipes away from the tramways, they found them sound.

By the CHAIRMAN: He had had two lengths of mains opened ten days or so ago—in the one case 1500 yards, and in the other 1300 yards from the tram rail—and they were sound. The cases he had quoted were quite close to the rails. The farthest away was 30 yards.

The CHAIRMAN intimated that the Committee were satisfied that, under certain conditions, pipes could be fused by electricity.

Mr. *W. E. Ayrton*, Professor of Electrical Engineering at the City and Guilds of London Technical Institute, examined by Mr. PADDON, said there were two kinds of damage caused by electricity, which he described. The Board of Trade regulations were intended only to diminish leakage; they certainly did not stop it. The more cars, the greater the tendency for the current to leak into gas and water pipes. If the joints of a pipe were extremely bad, a high resistance would be offered, and little current would flow; but if they were pretty good, a much larger current would flow. If there were a great number of good and a few bad joints, the electricity would jump the joints; and if there is anything like sewage in the soil, then, ultimately, where the current left the pipe to go round the joint through the earth, there would be electrolytic damage done. It was extremely difficult for a gas company to find out what current was flowing along one of their pipes. He thought that so long as the Board of Trade rules were as they were, it was a prudent thing for a gas company to get a clause inserted in a Tramway Bill. The Board of Trade could not go behind an Act of Parliament; and that was why the protection clause was desirable.

In cross-examination, witness said that in 1901 he had said he believed the Board of Trade regulations were insufficient; now he said he was sure of it. In some cases, he thought that the question whether corrosion was due to electric tramways had been definitely answered. He did not know that, assuming his case was proved, all it showed was that the Board of Trade regulations were insufficient. It showed they should be altered.

Sir RALPH LITTLER, K.C., then addressed the Committee for the Company on the question of electrolysis. He said it was a matter of importance, not only to gas companies, but also to gas consumers, because, if fusion or electrolysis went on undetected, it might be the cause of serious explosions. His Company were performing their lawful duties; and the Corporation had now come along with their tramways—really as mere traders, because these tramways would be a source of profit, and what was more reasonable than that they should pay for any damage caused by their undertaking. The clause the Company asked for was as follows: "If at any time it be proved that any injury or damage to any mains, pipes, or apparatus of the Brighton and Hove General Gas Company shall have resulted from the generation, distribution, or use of electrical current, nothing in this Act, or any Act or Order, shall relieve the Corporation from liability to compensate for such damage." He did not care about the Board of Trade rules. Why were gas companies to be exempted from the general law that he who caused damage to another's property should pay for it? Mr. Sellon had said "You go to the Board of Trade;" but it seemed to him—he was going to say—impudence to say: "The Board of Trade have some regulations ten years old, be content with them." But why were they to wait and go to the Board of Trade? They had a right to come to the Committee; and it was for their Lordships to judge of their case. He disputed the proposition that the Board of Trade could make retrospective rules. They could not; their powers were only from the time when they were dated. It

might be two or three years before they would make any new regulation; and, meantime, this tramway would have been made. The moment the Royal Assent was given to the Bill, the Corporation might make their tramway, which would be subject to the regulations and provisions then in force; and it would be impossible to say that the Board of Trade regulation could have a retrospective effect.

Mr. TALBOT, for the promoters, said they felt there was something in this point. Their view of the law was that they would be subject to any new regulation; but if there was any doubt, they would accept a clause subjecting the whole of the tramways of the Corporation to any regulations the Board of Trade might from time to time make.

Sir R. LITTLER said if there was a danger which could be proved to the Committee, why were they to wait for protection until they had converted the Board of Trade? Mr. Sellon had said that they could at any time examine the station records of the tramways. But why was that to be put upon them? Of course, a Parliamentary Committee was elastic and not bound by rules, and would do justice when it found out that injustice was going to be done. That was why he was there, and why he did not want to go to the Board of Trade.

Wednesday, July 8.

Mr. BAGGALLAY, in addressing the Committee for the promoters, said the question of damage by electrolysis had been considered by Parliament for a good many years; and in 1893 a very strong Joint Committee had inquired exhaustively into the whole subject. The Committee had recommended that the Board of Trade should make "regulations for securing the best system of working electric tramways and railways, having regard to the expense involved by the carrying out of such regulations, and to the effect thereof upon the commercial prospects of the undertaking." There must be a point at which, of course, stringent regulations would stop enterprise—an event which the Committee did not desire. The Board of Trade, shortly after the report of the Committee, made such regulations. After dealing with the regulations in detail, Counsel said the two clauses for the protection of gas and water companies were in the present Bill. These regulations the Board had made with great care; a conference being held at the offices of the Board (which lasted for two days), of all the gas and water, telephone, telegraph, and railway companies. From time to time, with the assistance of fresh information, the Board of Trade had amended the regulations first made, in the direction of using new appliances to detect and locate escapes of electricity. About 1900, there began, however, a series of applications to Parliament for variation of the existing practice, and for the insertion of special clauses in Acts of Parliament. After giving a history of the various attempts to obtain protective clauses, Counsel said in 1901 the London United Tramways case came before Parliament. The question of damage to pipes by electricity was again very fully gone into; and Sir J. Kennaway's Committee declined to insert any clause. On that Bill coming before the Duke of Northumberland's Committee, it was agreed between the parties that a clause should be inserted, not for giving protection on account of electrolytic action or fusion, but to make clear what the Water Companies said was doubtful—that the Board of Trade should be able to compel the adoption of new regulations made by them by tramways working under the original rules. This was not such a clause as was now proposed by the petitioners. To do what was now asked would be to go back upon the report of Lord Cross's Committee, and to alter the policy then laid down, and to interfere with enterprise by creating constant litigation. If the petitioners had any doubt as to whether the Board of Trade could put upon the Corporation new regulations, he was prepared to make that clear. It was done by agreement in the London United Tramways case; and such a clause would be this: "The powers of the Board of Trade, under section 20 of the Act of 1900, as incorporated with this Act, shall be deemed to include power subject to the provisions of that section to make regulations requiring the corporation to use such reasonable precautions, including insulated returns, as the Board of Trade may think necessary for the purpose of the said section, and the Board of Trade may, in like manner, from time to time alter any such regulations." He was perfectly willing to give that; but he objected to the clause brought up by the promoters—"If at any time it be proved that any injury or damage to any mains, pipes, or apparatus of the Brighton and Hove General Gas Company shall have resulted from the generation, distribution, or any use of electric current by the Corporation, nothing in this Act, or any Act or Order, the whole or parts of which are incorporated herewith, nothing in this Act shall relieve the Corporation from liability to compensate for such damage." This went back on the intention of the Joint Committee and the Model Bill clauses, and the Board of Trade regulations made under them. If the petitioners thought that they had real evidence of damage to pipes by electrolysis or fusion, they should go (as Sir Courtenay Boyle had said) before the Board of Trade and satisfy them as to what was going on, and get the Board to alter their regulations to stop the damage. It was not right to come and ask Parliament on particular Bills in order to make special legislation.

The Committee having deliberated,

The CHAIRMAN said: The Committee are of opinion that there should be a protective clause protecting the Gas Company, but only as regards the tramways considered and allowed in this Bill; and they suggest that possibly this might be reached by omitting the words in the fifth line "or in any Act or Order the whole or parts of which are incorporated herewith."

Ultimately, a clause was inserted as follows: "If at any time it be proved that any injury or damage to any mains, pipes, or apparatus of the Brighton and Hove General Gas Company shall have resulted from the use of electric current on any of the tramways authorized by this Act, nothing in this Act shall relieve the Corporation from liability to make compensation for such injury or damage."

The preamble of the Bill having been proved in its entirety, and the clauses adjusted, the Bill, as amended, was ordered for report.

HOUSE OF COMMONS COMMITTEE.

Friday, July 3.

(*Mr.* HEYWOOD JOHNSTONE, *Chairman.*)

BIRMINGHAM CORPORATION BILL.

In this Bill the Corporation apply for power, among other things, to construct gas-works at Erdington, on land already belonging to them.

Mr. BALFOUR BROWNE, K.C., Mr. BLENNERHASSETT, K.C., and Mr. GERALD FITZGERALD appeared for the Corporation. The petitioners in opposition were represented as follows: The Erdington Urban District Council by Mr. C. C. HUTCHINSON; and Mr. Ernest Welcome Richards, by Mr. CLEASE.

Mr. BALFOUR BROWNE said the only opposed part of the Bill was the proposal to take about 120 acres of land in the urban district of Erdington, on which to erect gas-works; it being absolutely necessary that Birmingham should have further works in order adequately to supply their area with gas. The site was most suitable in every way. It was situated to the north-east of Birmingham—a district which already suffered to some extent from the smoke of the town; it was close to an enormous sewage farm, 3000 acres in extent, which dealt with the sewage of the whole district, or a population of 800,000 people; and it was bordered on one side by a canal, which would be exceedingly convenient for the carriage of coal and for the export of residuals, and on the other side by very good roads. The Erdington Council feared that their interests would be prejudiced by the presence of gas-works in their midst; and Mr. Richards objected to the proposal on the ground that it would injure his house and land, known as the "Rookery," where he lived and carried on the business of a fruit and vegetable grower. The days of Erdington as a residential district had, however, passed away. Although there were some residences in it of importance, its character was rapidly changing. The site was the property of the Corporation, and they believed that, instead of deteriorating the district, the gas-works would bring to it a very large number of people. These would require houses, and, consequently, the rateable value of the area would go up. Apart from this, the works that would be erected would be very valuable, and the rates on them would inure to the benefit of Erdington. Since the Bill was before the House of Lords, statistics had been obtained showing that, of the houses erected in the district in the past year, only one had a rateable value of over £50; and in that case, the house contained a shop. It was evident, therefore, that the character of the district was not high-class, but industrial, and very well suited to receive gas-works.

Mr. *Bishop*, the Chairman of the Gas Committee of the Birmingham Corporation, said the population of the gas area had increased from 477,000 in 1871 to 820,000 in 1901. The gas consumption had risen from 2400 million cubic feet in 1876 to 5900 millions in the year ending March, 1902, which was an average annual increase of 4 per cent. compound. It was now urgently necessary to erect new gas-works; and the Committee felt they would not be safe unless they provided for an increase of 4½ per cent. compound, having very nearly put the town in darkness on more than one occasion in the past. The Erdington site, which was selected only after careful inquiry as to the possible sites in the district, would enable the Corporation to meet the probable increase in the demand for at least 25 years. In choosing the site, the Committee had special regard to the area in which the demand for gas had been greatest.

In cross examination by Mr. CLEASE, witness said Mr. Richards's property was not near enough to the site to be affected by the smoke or chemicals at the works. The works could not injure Mr. Richards's business, if at all, for at least seven or eight years. At the end of that time, if his property was injured, he could sell his land, probably at an enhanced price, and go elsewhere.

Mr. *Henry Hack*, the Chief Engineer to the Gas Department, said the Corporation had five gas-works—four in Birmingham, and one at Swan Village, West Bromwich. By crowding the works at Windsor Street, their production could be increased by a million-and-quarter cubic feet; but that would be very uneconomical, and should not be done. At the Nechells works, there was land on which further works giving an increase of 5 million cubic feet could be erecteed. These works were being extended. When all the available land of the Corporation was used, the production of the works would be 42⅛ milion cubic feet, after allowing for the abandonment (now in progress) of the small works at Adderley Street. Deducting 10 per cent. for reserve, the capacity of the works would be about 38½ million cubic feet. It was most desirable for so large a district as that of Birmingham to provide land for the increases of the next 25 years. It would be necessary to commence the works in 1904, or in the spring of 1905, in order to have time to get one section of them finished by 1908, when they would be required. After considering many sites, the Committee of the Corporation came to the conclusion that the one at Erdington was the most favourable for their purposes. One advantage connected with it was that with comparatively small expense a branch line could be made connecting it with the Midland Railway, which served Derbyshire and South Yorkshire—the districts from which gas coal chiefly came.

In cross-examination by Mr. HUTCHINSON, witness said it was not necessary to commence the construction of new works for two years. The Corporation used water gas to the extent of about 20 per cent. Plant for the manufacture of such gas occupied less area than that for the production of ordinary coal gas. He did not think there were many well conducted gas-works where they used 40 per cent. of water gas. Asked whether the whole of Erdington would not look down on this "smoking stinking monster," witness said he did not know anything of the kind. The equivalent of 8000 retorts would be opened daily, and from each probably there would be a small escape of gas; but he did not agree that that meant 8000 small stinks.

Mr. *Corbet Woodall* stated that the total producing power daily of the existing works of the Corporation was 39¾ million cubic feet, or,

deducting 10 per cent. for contingencies, 35¾ millions. Deducting, further, the capacity of the Adderley Street works, and adding 5 million cubic feet (the quantity by which the production of Nechells could be increased), the maximum productive power would be 38¼ million cubic feet. All the works except Nechells were incapable of extension; and it would not be wise or remunerative to continue the manufacture of gas at Adderley Street. In the last six years, the gas consumption had increased at the rate of 5·84 per cent. per annum. The maximum day's consumption, he was informed, was 33¼ million cubic feet, which, at the rate of 4·2 per cent. per annum increase, would amount to 39⅞ millions in 1907. The capacity of the works would be overtaken in 1904, but for the extension at Nechells. In 1907, there would be a deficiency of 3½ per cent. in the capacity of the works. Thus there was necessity for an extension being at once commenced. The site proposed was a very good one. He resented the idea that gas-works were necessarily a nuisance. If they were crowded—and there was a temptation to crowd gas-works when they were constructed in a town—there was a tendency for them to become a nuisance. He knew of no other manufacture of the same importance which, granted sufficient space, could be conducted with less nuisance.

Sir *George Livesey* said the site selected was an ideal one. In his opinion, the erection of gas-works there would not cause any real inconvenience to the neighbourhood. In a short time, in consequence of the ownership of these works, the Corporation of Birmingham would be the largest contributors to the rates of Erdington.

In cross examination by Mr. CLEASE, witness said the use of oxide of iron had very greatly decreased the offensive smell arising from gas manufacture. Now no bad odours such as would cause objection were emitted by gas works. The only objection was the smoke.

By Mr. HUTCHINSON: It was possible to employ a much larger proportion of water gas than was used here. A very fair proportion was 25 per cent.; 40 per cent. was high, though there were companies who used more.

Mr. *Hampton Barber*, Secretary to the Gas Committee, said the profit of the gas undertaking last year was £56,900, the year before £31,000, and the year previous £553. This profit was handed over towards a reduction of the rates.

Mr. *G. S. Matthews* gave evidence that the construction of the gas-works would not deteriorate the value of property in the neighbourhood, and that the district was becoming an industrial area in which small property was being erected.

Monday, July 6.

Mr. *W. Fowler* gave evidence as to the difficulty of finding purchasers for the large house on the site of the proposed gas-works, and for the "Rookery." The former was eventually sold to the Birmingham Corporation for £15,500, and the latter to Mr. Richards, one of the petitioners, for £4000. The property in the neighbourhood of the site was small in character. The presence of the sewage farm had already deteriorated the neighbourhood; and he did not consider that the construction of gas-works would further depreciate it—indeed he thought they would rather tend to enhance the value of the surrounding land for building purposes.

This closed the case for the Bill.

Mr. *E. W. Richards* gave evidence in support of his own petition. He stated that rather than run the risk of endeavouring to carry on his business with the gas works adjacent to his gardens, he was prepared to sell his business to the Corporation and move away; or, as an alternative, he would purchase the whole of the estate from the Corporation, recoup them the whole of their expenses, and give them £10,000 in addition, rather than have Erdington turned into a second Saltley.

By the CHAIRMAN: He had had no actual experience of the effect of gas-works upon garden produce; but he was apprehensive that what Saltley and Nechells were now, Erdington—and with it the "Rookery"—would become hereafter, if the Corporation were allowed to erect gas-works on the site proposed.

Mr. *R. Fowler* said he calculated the value of the "Rookery" by itself, apart from the greenhouses, at £5000. The whole of the property would be seriously depreciated by the presence of the gas-works, and it would be very difficult for Mr. Richards to obtain a suitable place in the neighbourhood in which to carry on his business. It would also be very difficult for Mr. Richards to obtain compensation from the Corporation if the proposed works were erected. He was aware that the rateable value of Mr. Richards's property had been reduced from £125 to £108.

Mr. *G. Glydon* also testified to the injury which the works would cause Mr. Richards. The cost of reinstating him elsewhere he put at £1500.

Mr. CLEASE having addressed the Committee on behalf of Mr. Richards, evidence was called in support of the remaining petition.

Mr. *Dawson*, the Chairman of the Erdington District Council, said of recent years rapid development had taken place in the district; the houses erected being chiefly of from £26 to £30 rental. The great majority of the people in Erdington were strongly opposed to the utilization of the site in the manner proposed.

Sir *P. A. Muntz*, M.P., said a large part of Erdington was a pretty, suburban, and, practically, a rural, district. He pointed out that some hospitals had been erected there because of the good air and suitability of the soil, and expressed the opinion that plenty of the sites for the gas-works could be found in other places where the air was already polluted by smoke and gases from manufactories.

Mr. *E. H. Stevenson*, examined by Mr. HUTCHINSON, said the productive capacity of the existing gas-works of the Corporation was about 45 million cubic feet daily; whereas the maximum demand was only 30 millions. The gas supplied by the Corporation contained only 20 per cent. of water gas; and it was possible to provide for an increase in the supply of gas by means of larger use of water gas. As much as 50 per cent. of water gas had been used, and 40 per cent. was not at all uncommon. If such a proportion were used, the Corporation would be able to produce 60 million cubic feet daily instead of 45 millions. This would mean that the existing works would be adequate for the needs of Birmingham for another 17½ years. There was no immediate necessity for the commencement of the new works, though the Corporation were acting wisely in looking out now for a new site. If the Corporation were not allowed to use the site for purposes of gas manufacture, they would suffer no loss whatever. He knew other and better sites; and he saw no reason why the Corporation could not obtain one of them. The proposed site was certainly not an ideal one. It was some distance from the railway; and a connecting siding would have to be constructed at an inclination of about 1 in 65—the site itself on one of the cross-sections being at an inclination of 1 in 27. There were no engineering difficulties connected with it; but it would entail extra engineering cost in construction. The neighbourhood was not one in which gas-works should be placed, if, by any possibility, a site elsewhere could be obtained. He held that other equally suitable sites, and at about the same cost, could be procured. The smoke and offensive sulphurous fumes from the retorts would be a trouble to anyone near the works. There might be 24,000 openings of retorts in a day, and there would be as many little smells. There would also be a smell of sulphuretted hydrogen when the coke was slaked; but that would not travel so far as the smoke from the works. The gigantic gasholders which would be erected would work together to deteriorate the district and to check its development. The Gas-Works Clauses Act did not meet the difficulty with regard to compensation, because gas-works could be very well managed and yet prove an injury to the neighbourhood.

In cross-examination by Mr. BALFOUR BROWNE, witness said gas-works could not be conducted without being a nuisance to people living close by, although the nuisance might not be a legal one. People living as close as the "Rookery" must suffer annoyance from the proposed works.

Mr. BALFOUR BROWNE: What is the distance you say the annoyance goes?

Witness: If it is a properly-managed works of ordinary size, with the purifiers properly cleared of gas and sulphur before they are changed, I think a quarter-of-a-mile, generally.

In further cross-examination, witness said large works, such as those which would doubtless be erected here, should be at least half-a-mile from a residential neighbourhood. He had an open mind as to employing more than 20 per cent. of water gas. It was not usual to limit, by Act of Parliament, the amount of water gas allowed to be supplied in coal gas.

Tuesday, July 7.

Mr. *Asforth*, the Clerk to the Erdington Urban District Council, stated that 3712 voting papers were distributed in the district, in order to ascertain the opinion on the gas-works scheme. There were 1134 votes given against, and 961 in favour of the scheme.

Mr. *Humphreys*, Surveyor to the Erdington District Council, said the population of the district was suburban rather than working class; the majority of the houses there being rated at from £25 to £30. The proposed site was eminently suitable for the erection of houses of from £20 to £40 rental. The establishment of the sewage farm in Erdington was a great blow to the place at first; but improvements had been effected, so that now there was practically no nuisance in connection with it.

Mr. *W. E. Lee*, a member of the Erdington District Council, gave evidence that the erection of the gas-works would depreciate the class of houses likely to be erected in the district.

Mr. *Yates* stated that, following upon the proposal to erect gas-works, he had had to reduce the rent of one property in Erdington from £120 to £80, and in another case to annul a lease.

Counsel having addressed the Committee,

The CHAIRMAN announced that it was the unanimous opinion of himself and his colleagues that the preamble of the Bill, so far as it related to the user of the land in Erdington for gas purposes, was not proved.

COURT OF REFEREES.—Tuesday, July 7.

WILLESDEN URBAN DISTRICT COUNCIL BILL.

This Bill came before the Court to-day—Mr. PARKER SMITH presiding—in connection with a petition which the Gaslight and Coke Company sought to present in opposition, and to which the promoters of the Bill took exception.

Mr. FRERE, for the Gaslight and Coke Company, said the clause in respect of which *locus standi* was sought was No. 9:

The Council may purchase, provide, supply, sell, let, use, and otherwise deal in, fit up, fix, alter, repair, remove, and refix (but shall not manufacture) electric lines, fuses, switches, fittings, meters, lamps, lampholders, motors, and other apparatus incidental to, or connected with, the use or used in the supply of electrical energy, and may provide materials and do all work necessary or proper in that behalf, and may take such remuneration, rents, or charges, and make such terms and conditions with respect to such supply, sale, letting, using, fitting, fixing, altering, repairing, or removal, or refixing of such apparatus, or the provision of such materials, or the doing of such work, and for securing the safety and return to the Council of articles and fittings let and otherwise as may be agreed upon between the Council and the persons to or from whom the same are supplied, sold, let, fitted, fixed, altered, repaired, removed, refixed, provided, or done. Provided that nothing in this section shall authorize the Council themselves to fix upon any consumer's premises electric light fittings or electric wiring other than may be required to complete the service line between the Council's supply mains and their own apparatus upon such consumer's premises.

Sir CHANDOS LEIGH: Was there not a London County Council Bill which had almost identically the same clause? And was there not an instruction of the House to strike it out?

Mr. FRERE: Yes.

Sir C. LEIGH: Did that go before the Court of Referees?

Mr. FRERE: The case of the South Metropolitan Gas Company and Woolwich, with this clause in, came before the Court of Referees.

The only difference between that case and this was that there they asked to be allowed to supply free.

The CHAIRMAN: Mr. Balfour Browne appeared on behalf of the Company.

Mr. FRERE: Yes; and you gave him *locus*.

Mr. WORSLEY TAYLOR: That was in virtual contravention of an Act they obtained last year?

Mr. FRERE: That was so. They had the Bermondsey clause in their Act before. Then they came with this clause to supply fittings free. I do not think there is any distinction between that and the present case.

Mr. GREIG (for the promoters): We have the Bermondsey clause in the Bill.

Mr. FRERE: That case turned on the fact that they had power to supply these things free. Now, under this clause, they can make a perfectly nominal charge.

Mr. GREIG: May I remind you, with regard to the County Council Bill, that they were not authorized to supply electricity originally. It was new competition absolutely.

Sir C. LEIGH: There were two points in the County Council Bill. First, the Council were trying to authorize the Borough Councils to do a particular thing; and then there was a point about "consumers and prospective consumers." On this, there was an instruction from the House; and the clause was struck out.

Mr. FRERE: There it was to enable people to do this who were already authorized to supply. Here they are taking power themselves to supply. I submit that this case is on all-fours with the Woolwich case.

Mr. B. JONES, after some discussion among Counsel, suggested that the following should be inserted at the end of clause 14, for the protection of the ratepayers: "So far as is reasonably practicable, the revenue for that year shall not be less than the estimated amount of the expenditure and of the charges for interest and sinking fund for that year."

Mr. FRERE: I quite agree that, so far as the general expenses of the undertaking are concerned, we are protected by clause 14. But that does not relate to the specific charges in clause 9; and inasmuch as in clause 9 they add the words "provide," "sell," and "use," which are totally new and outside the words authorized by the Public Acts, it is, in effect, sanctioning a new competition.

Mr. GREIG, in replying, pointed out that the Council, by supplying electricity, already competed with the Gaslight and Coke Company; and if the Bill made any change, it would only alter existing competition. It would not increase the competition much, because, under clause 55 of one of the General Electric Lighting Acts, the Council already actually had the power to supply fittings and meters. Clause 9 was a little enlargement of the existing powers of the Council. The argument as to enabling them to supply fittings free was baseless in view of the proviso to the clause, which was in no other Act, and which cut down the Council's power to supply these things, and rendered it necessary to engage an outside contractor to fix them. The Council, of course, could not get an outside contractor to work for nothing; and it was hardly likely that they would pay the contractor and not require repayment from the consumer. Clauses 9 and 14 would prevent the undertaking being carried on at a loss, and therefore it must be conducted on commercial principles. He submitted that the Company had no right to *locus standi*.

The CHAIRMAN, after a short deliberation with his colleagues, said: The *locus* is disallowed by a majority.

Reductions in Price.—Among recent reductions in price is to be noted one of 2d. per 1000 cubic feet at Slough and Datchet, and another of 1d. per 1000 cubic feet at Fenton.

Public Lighting of Uxbridge.—The Uxbridge Urban District Council, at their last meeting, adopted a report of the Streets and Works Committee in which they recommended that the Electric Light Company's tender of £2 5s. 6d. per lamp per annum for 55 Nernst lamps be accepted for a term of three years, and their tender of £10 per annum for lighting and extinguishing the same; and that the tender of the Gas Company of £3 os. 8d. per lamp per annum, including lighting and extinguishing, be accepted for the remaining lamps in the district (some 142 in number) for either one or three years.

Cessation of Natural Gas Supply in Indianapolis.—As the result of the cessation of the supply of natural gas in Indianapolis, something like 5000 consumers were deprived of their usual fuel for culinary purposes. In these circumstances, the Gas Company made arrangements to connect up the stoves with the ordinary gas-pipes in service; the Company's mains extending to nearly all the parts of the city where natural gas was supplied. It is thought that ordinary coal gas may in the near future be sent to West and North Indianapolis, Brightwood, Irvington, and other places where there are no artificial pipe-lines, by passing it through the natural-gas mains which are to be abandoned in those parts of the city.

Steam v. Gas-Engines on Gas-Works.—From a report on the affairs of the Dronfield Gaslight Company presented to the Board by Mr. C. E. Jones, Consulting Engineer, of Leyton, it is a pleasure to learn that the undertaking is in a prosperous condition. The production of gas has doubled itself in ten years; and this will necessitate an increase of carbonizing power very shortly. An extension of the prepayment system and the supply and maintenance of mantles, as also the encouragement of the use of gas for the manifold purposes to which it is applicable, is advised by Mr. Jones; and the abolition of steam-engines on the works, and their substitution by gas-engines for economical and other reasons, is also advocated. When worn out, the present steam boilers, he urges, should not be replaced; but should steam be required for other than motive power, he advises the employment of a portable boiler of the coffee-pot type. The example of a gas company in an industrial locality using gas-engines is a good one; and in Mr. Jones's opinion it will act as a stimulus to power-users, and extend the use of coal gas in the forges and tool factories in the town and neighbourhood.

LEGAL INTELLIGENCE.

SUPREME COURT OF JUDICATURE—COURT OF APPEAL

Tuesday, July 7.

(*Before Lords Justices* VAUGHAN WILLIAMS, ROMER, *and* STIRLING.)

Ilford Gas Company v. Ilford Urban District Council and J. Jackson (Third Party).

This was an action which came before Mr. Justice Lawrance and a Special Jury in June and July last year.* It was a claim by the Ilford Gas Company against the Urban District Council for damage done to their gas-main in a thoroughfare called the Green Lanes, Ilford, by the construction of sewerage works. The Urban District Council brought in Mr. Jackson, the Contractor for the works, as a third party; alleging that if any negligence was proved to be the cause of the accident, he was liable. At the trial, the Jury gave a verdict for the plaintiffs for £200; and they also found that there was no negligence on the part of the Contractor. It was agreed by the Counsel that the question of the liability of the Contractor, as between him and the Urban District Council, under his contract, should be argued before Mr. Justice Lawrance on his return from circuit. This took place in August, and further evidence was then called by the Council to show that the Contractor had been guilty of negligence. In the result, his Lordship gave judgment to the effect that Mr. Jackson was liable under his contract, quite apart from any question of negligence. The case now came before the Court on appeal, by Mr. Jackson, as against the Council; and in the event of his success, there was one by the Council, asking for a new trial on the question of the finding of the Jury that the Contractor had not been guilty of negligence.

Mr. DUKE, K.C., and Mr. W. MACKENZIE appeared for Mr. Jackson; Mr. C. A. RUSSELL, K.C., and Mr. WHITELEY represented the District Council.

It was agreed between Counsel that the only question on the first appeal was on the construction of the contract, although it seemed somewhat doubtful, on the terms of the learned Judge's judgment, whether he had not attributed negligence to the Contractor.

The arguments had not concluded when the Court rose.

Wednesday, July 8.

On the case being resumed this morning, considerable discussion took place with regard to the finding of the Jury that there was no negligence on the part of the Contractor, which Mr. Russell submitted was not binding upon him. Ultimately, on the suggestion of Lord Justice Romer, it was arranged that there shou'd be a new trial before a Special Jury on the issue thus formulated: Was the injury due to the nature of the works which the Contractor was bound, or directed, to execute, or was it due to the mode in which the wo ks were executed? It was also decided that the present appeal should stand over until after the new trial; so that it would be still open to Mr. Russell to argue that the Contractor was liable, under the terms of his contract, to indemnify the District Council.

SUPREME COURT OF JUDICATURE—COURT OF APPEAL.

Friday, July 10.

(*Before Lords Justices* VAUGHAN WILLIAMS, ROMER, *and* STIRLING.)

Colwyn Bay and Colwyn Urban District Council v. Conway Rural District Council.

This was an appeal from the judgment of Mr. Justice Bigham, given Aug. 4, 1902,† upon a special case. The question was whether the respondents are liable to pay a proportion of the cost of maintenance of a water-main, lying within the district of the appellants, but through which water was conveyed to the district of the respondents. In 1891, three adjoining Local Authorities were formed into a joint water-supply district, under a Provisional Order, for the purpose of providing water for the united area. After a few years, it became necessary to enlarge the existing mains; but the Conway Authority objected to this being done by the Joint Board. The matter then went to arbitration, when an award was made that each district should bear the cost of the new mains within its own area. The appellants contended that this made them the owners of the trunk main, and that they were entitled to charge the respondents a proportion of the cost of maintaining it, as they derived their supply of water through it. Mr. Justice Bigham decided against them, and they appealed.

Mr. S. EVANS, K.C., and Mr. R. B. BANKES appeared for the appellants, and argued their case at great length.

Mr. MACMORRAN, K.C. (Mr. HEMERDE with him), for the respondents, submitted very shortly that his clients were entitled, under the Provisional Order, to a sufficient supply of water, to be delivered at the boundary of their district by the Joint Board; that they had always repudiated any responsibility to pay for the maintenance of the mains outside their own area; and that no agreement was implied on their part to make such payment to the appellants.

Justice VAUGHAN WILLIAMS, in giving judgment, said he had a great deal of sympathy with the Colwyn Bay people, who had had to pay £7000 for the maintenance of these pipes, and *primâ facie* it would look as if Mr. Balfour-Browne, the Arbitrator, must have thought that the pipes in the portion of the district in question were the property of the Colwyn Bay Authority, and not of the Joint Board. But

* See "JOURNAL," Vol. LXXIX., p. 1581; Vol. LXXX., p. 286.

† See "JOURNAL," Vol. LXXX., p. 407.

his award did not find this in terms; and therefore the Court must be guided by the facts of the case, and not by any inference to be drawn from the award. Looking at the facts, it was impossible to suppose that these pipes, from their size, were for the purpose of distribution only. It was plain that they were laid down as trunk mains, by the Joint Board, in what the Board considered was the performance of their duty. The decision of the Arbitrator as to who was to pay the cost of laying the pipes could not be taken as conclusive test of ownership. Coming, as he did, to the conclusion that the pipe in respect of which the dispute arose was part of the trunk main, there was no question to argue. He could not conclude without suggesting that the Joint Board and the various constituent authorities should meet and endeavour to arrive at a fair adjustment and settlement of the question as to how the cost of maintaining these trunk mains should be borne in future.

Lords Justices ROMER and STIRLING each delivered judgment to the same effect.

The appeal was therefore dismissed, with costs.

THE BUEB CYANOGEN RECOVERY PROCESS.

The Validity of the German Patent Pronounced.

The Nullity Division of the German Patent Office has recently decided an action, brought by Dr. Alfred Stern, of Berlin, against Dr. J. Bueb, the Chemist to the German Continental Gas Company at Dessau, to test the validity of the patent rights granted to the latter in Germany, under patent No. 112,459, dated Feb. 16, 1898, for his "Process for the Recovery of Cyanogen Products from the Gases from Dry Distillation." As the German Court, presided over by Privy Councillor Delbruck, has refused to annul Dr. Bueb's patent after hearing the evidence tendered on behalf of Dr. Stern, and as the time during which appeal could be made against the decision of this Court has now elapsed without notice of appeal having been served, it follows that Dr. Bueb's patent rights in Germany are incontestably established. In view of the importance of this decision, we give below an epitome of the grounds on which the German Court states that it was based.

The petitioner bases his case on the process having been known through Knublauch's patent specification (German Patent, No. 41,930) prior to Bueb's application for patent No. 112,459. It may be admitted that, among the many statements of specification No. 41,930, a suggestion can be found of the method covered by the attacked patent. In the claim, it is said that the use of further alkali is unnecessary when there is enough ammonia in the gas, and the absorbing liquid then only needs the addition of a substance of a Group "B"—such as iron. It may also be granted that the prescription given with regard to the quantity of iron to be used is adequate—viz., that if it is desired to separate the cyanogen, not as a compound which remains in solution but as a solid compound, more iron must be taken in proportion to the alkali than is prescribed in the same clause. Only it must also be admitted that while a suggestion is here made, it is, in the first place, not such that a technical man, without knowledge of the process of the attacked patent, could forthwith understand and use it, and, in the second place, the information about the process of the attacked patent is not exhaustive. According to the patent law interpretation, a suggestion only avails to dispose of novelty when it is adequate, under the first stated conditions.

Now the defendant has made it plain that specification No. 41,930 embodies certain prescriptions, which still further thrust into the background the suggestion—in itself not clear—as to the mere use of the ammoniacal liquor with a larger quantity of added iron. There are, for instance, all the places where mention is made of adding to the absorbent alkali, under which term it appears elsewhere in the claim ammonia is not comprised. For example, in the introductory words of the specification, reference is made to the well-known solid "mixture of iron salts with alkalies or alkaline earths"—*e.g.*, "Laming's Mixture"—being displaced "by a liquid which contains alkali, alkaline earth, or magnesia as well as iron."

The technical man will gather from this introduction that the new method must be carried on at a stage in the process of gas manufacture at which the ammonia has already been taken out of the gas. On the other hand, it is apparent from the description that the process is characterized by crude gas, which has not been freed from ammonia, being subjected to the action of the absorbing liquid. Moreover, the patent does not stop at prescribing an absorbing liquid containing iron which with the ammonia in the gas must retain the cyanogen in the gas; but it prescribes a concentrated solution of an iron salt, containing, relatively to the ammonia (which is present in large proportion), very much iron, but insufficient water for the absorption of the ammonia contained in the gas. The absorption results in a compound of iron—cyanogen and ammonia—being produced; while so much ammonia remains in the gas unabsorbed that the gas must be freed from it in special apparatus placed posterior to the cyanogen absorption plant. The concentration of the solution of iron, and especially its small content of water, is characteristic of the process, and is nowhere referred to in Knublauch's specification. The petitioner has not made out that the use of a solution containing but little water is inferred in the latter; for the whole process described by Knublauch points to the resulting compound of cyanogen being produced and retained in solution, and occasional separation of the compound in the solid state is made to depend only on the rise in the proportion of the iron to the alkali. The petitioner's further plea—that the ammonia, in so far as it was not required for the process, had for years been allowed to pass on in all large gas-works—rests on the false assumption that the process in question had now been freely worked for years. The process protected under the attacked patent, therefore, is held to be novel in so far as anything protected under Knublauch's patent No. 41,930 is concerned. The costs of the action are to be met by the petitioner.

The Marylebone Electric Lighting Award.

In the Chancery Division of the High Court of Justice, on the 2nd inst., Mr. Justice Buckley had before him the case of *The Metropolitan Electric Supply Company, Limited, v. Mayor, Aldermen, and Councillors of the Metropolitan Borough of St. Marylebone*. It was an action by the plaintiffs to enforce specific performance of a contract for the sale of a portion of the plaintiffs' undertaking to the defendants under circumstances with which our readers are fully acquainted. In the result, his Lordship gave judgment for the plaintiffs, and directed that there should be an inquiry as to the title to certain leasehold and freehold premises included in the contract. He referred it to Mr. C. A. Russell to take accounts of the capital and other expenditure and all the receipts of the Company from Dec. 31, 1901, to the completion of the purchase, and left it to him to determine what part of such capital and other expenditure ought, for the purposes of the accounts, to be allowed as between the plaintiffs and the defendants. He fixed Dec. 31, 1903, as the date for completion, and directed that the sum of £100,000 should be paid into Court by the defendants, the balance of the purchase-money to be paid to the plaintiffs. He gave liberty to apply to extend the time for completing, and reserved the costs. It was arranged that if the parties could not agree on Mr. Russell acting as directed by his Lordship, Mr. Pollock (Official Referee) should conduct the inquiry.

Sheep Washing in Streams Feeding Water-Works.

In the High Court of Justice, Chancery Division, last Friday week, before Mr. Justice Byrne, Mr. Levett, K.C. (with him Mr. Underhill), moved for an injunction restraining a person named Walker from washing sheep or other animals in any stream connected with the water-works of the Bradford Corporation. He said the defendant did not appear; and therefore he would read sufficient evidence to show that the plaintiffs were entitled to the order asked. Mr. James Watson, their Water Engineer, in his affidavit, stated that, by virtue of the provisions contained in the Bradford Corporation Water-Works Acts, 1890 and 1892, with which was incorporated the Water-Works Clauses Act, 1847, the plaintiffs were authorized and empowered to take all the streams and water named in section 9. The Nidd Valley works were designed by witness, so far as they had been completed, and had been carried out under his supervision in all respects pursuant to the Act. The aqueduct which conveyed the water to Bradford intercepted a number of streams which were tributaries of the lower reaches of the Nidd. The moorland farms through which the aqueduct passed were occupied principally for sheep grazing; and, up to the construction of the water-works, the tenants had, without any restriction, been in the habit of washing their sheep in several of the streams. The result was that deleterious and offensive matter passed direct into the aqueduct of the Corporation. On the 16th of June, defendant washed a large number of sheep in the Blayshaw Gill, being one of the streams mentioned in the Act, with the result that for three days the plaintiffs were unable to take any water therefrom. Unless the defendant was restrained, the health of the population of Bradford must be prejudicially affected. His Lordship granted an injunction restraining defendant washing sheep or other animals in the stream known as Blayshaw Gill, so as to foul the water flowing into plaintiffs' works, or any part thereof.

Placing Buttons in a Prepayment Meter.

A case was heard at the Todmorden Petty Sessions recently in which a man named Thomas Harling was summoned by the Todmorden Corporation on a charge of fraudulently obtaining gas from a penny-in-the-slot meter. He was represented by his wife, who said it was true that at the time in question part of a button was in the meter; but there was certainly no intention to defraud. The Town Clerk (Mr. D. Sutcliffe), on behalf of the prosecution, stated that between March 17 and June 16 buttons and "co-op" checks to the amount of 1s. 4d. were found in defendant's gas-meter. This sort of thing had been done also in other cases, and the Corporation were in this way defrauded. The proceedings were taken, not because the prosecutors wished for severe punishment to be inflicted, but in order that users of penny-in-the-slot meters might be deterred from such practices. Mrs. Harling declared that the buttons had been used as a temporary convenience. She had intended to pay the money when the collector called; but she then happened to be away at work. She had since tendered the amount due. The Bench imposed a penalty of 1s. and costs, making a total of 10s. 6d.

Illegally Disconnecting a Meter.

On Wednesday, the 24th ult., at the Goole Petty Sessions, Frederick Gunnill, a plumber, was summoned for disconnecting a gas-meter without giving 24 hours' notice to the Goole Urban District Council (as prescribed by the Act) of his intention to do so; the penalty for such an offence being a fine not exceeding 40s. The Clerk to the Council (Mr. J. W. Johnson) said that on April 7 one the officials, when engaged in his duty of reading the meters, found that a meter at the Co-Operative Stores had been disconnected, and a straight piece of pipe inserted and connected with the main. The defendant Gunnill, who did the work for the Society, ought to have known better than to tamper with the meter. James Burton, the meter inspector, deposed to finding that one of the meters at the Stores, fixed in the bakehouse, had been taken out, and a pipe inserted connecting the supply-pipe direct with the main; and thus the Council were unable to obtain a true record of the amount of gas used. Mr. Jackson, the Manager of the Stores, stated that Gunnill was employed by the Society to remove the meter; and this was done, and a connection made direct with the service-pipe. He himself saw Gunnill do the work. The defendant was on the premises attending to some other matters when witness asked him to to this. In reply to the Bench, witness said that this was a second meter; and he thought that it only connected two of their own pipes. Instead of this, it was a direct service-pipe that was connected with it. The Chairman. Did

you tell Gunnill that the gas came from another meter to this one? Witness: No; there was nothing said about where the supply came from. The Chairman: You simply ordered him to take the meter away and make a connection? Witness: Yes. A Magistrate: Then the Society are to blame. Mr. Johnson pointed out that as Gunnill was a master plumber, he must have known that notice was necessary. The Magistrates' Clerk (Mr. E. T. Clark) did not agree with this, and thought the case had better be adjourned or another summons taken out against the persons giving the order. The case was therefore adjourned.

On the case again coming before the Court a week later, defendant elected to give evidence, and stated that he was sorry for the trouble he had caused, though he had done so innocently. The Manager of the Stores came to him, and asked him to do some repairs in the bake-house. After he had done them, he asked him to move the meter. He had been a plumber for seventeen or eighteen years, and knew he was liable to be fined if he interfered with meters; but when he told the Manager that he would get into trouble, the Manager said that the meter was connected with the meter in the shop. Witness then thought there would be nothing wrong in moving the meter, as the gas would still be registered, and therefore there was no intention to defraud on his part. The Chairman said that if there were a dozen meters in a house, and all were connected with one meter, defendant would have no right to move one until he had given notice. Some discussion then ensued between the Magistrates' Clerk and Mr. England (who on this occasion appeared on behalf of the Council) as to whether the defendant was the proper person to be summoned; Mr. England contending that the man who physically did the work was liable. The Magistrates' Clerk: Last week, in another case, the owner of a meter was summoned and fined. In this instance you have summoned the workman. What are the Bench to do? Mr. England: I do not know. You are directing the Bench. The Chairman: Are you taking any action against the Society? Mr. England: No. The Magistrates' Clerk asked if the defendant's apprentice had done the work when directed by his master, whether he would have been liable. Mr. England: Yes; but under such circumstances the Council would no doubt have taken no action. The Magistrates' Clerk: Not if the master stood by and watched him do it? Mr. England: Oh! my argument would be on another leg then. You might just as well say a master was liable because his boy broke a lamp glass when told to do so. The Magistrates' Clerk: That is criminal. Mr. England: But it is Act of Parliament. The Bench retired; and on their return into Court, the Chairman said they had come to the conclusion that the owner of the property was the man who was liable, and therefore the case would be dismissed. Mr. England said he was sorry to differ with the Bench, and asked them to state a case. The request was granted.

Water-Works Rating Appeal at Merthyr Tydfil.

At the last Breconshire Quarter Sessions, there was set down for hearing an appeal by the Merthyr Tydfil Urban District Council against the assessment of their new water-works near Torpanton; the respondents being the Assessment Committee of the Brecon Board of Guardians. Mr. Edward Boyle, K.C., with Mr. J. Plews, appeared for the appellants; and Mr. S. T. Evans, K.C., M.P., and Mr. Ivor Bowen, for the respondents. The appeal was against the raising of the assessment of the water-works from something like £2000 to £6000. Mr. Boyle, however, announced that the matter had been settled, on the lines that the rateable value should be reduced to £4850 net; this amount to be divided between the four parishes in the same proportion as at present. No costs were to be allowed to either side. The Court made an order accordingly.

Imprisonment for Stealing Gas.

At the Gateshead Police Court last Friday, a man named Michael Burns, a lodging-house keeper, was charged with the theft of gas value £14 2s. 6d. from the Newcastle and Gateshead Gas Company. Defendant pleaded guilty. John Treas, a plumber in the service of the Gas Company, said that on June 4 he went to the house of Burns to search for a gas leak. He found a legitimate escape; and during his further investigation, he came across a nailed-up cupboard, and on opening it found a joint in a pipe which was also leaking. He further discovered that a piece of pipe had been let into a larger pipe before it came to the meter. Thus gas was obtained without registration. The illegal supply served four brackets, one of which was kept incessantly burning. Mr. Wynn Parry, for the defence, urged that this was his client's first offence of any kind. The Chairman said that the crime accused had been guilty of was worse than knocking a man down and robbing him. Therefore the Bench proposed to make an example of him. They considered, however, that the defendant was an old man, and on this account they would be a little lenient. He would have to go to prison for four months in the second division.

Swaffham Gas-Works.—As noticed in the "JOURNAL" some time since, the proprietors of the Swaffham Gas-Works disposed of their undertaking to Mr. Worthington Church, subject to the Board of Trade sanction to the transference of the Provisional Order. The Board have now given their consent to the transfer, and Mr. E. G. Smithard, Engineer of the King's Lynn Gas Company, took possession of the works, on behalf of Mr. Church, on the 3rd inst.

The Damage Caused by the Maidstone Explosion.—At the meeting of the Maidstone Urban District Council on Wednesday, the Highways Committee presented a report in regard to the cost incurred in repairing the damage caused to the bridge by the gas explosion last November. It supplies a complete justification for the action of those who pressed for, and eventually obtained, an acceptance of the Gas Company's offer of £500 by way of compensation. The amount actually spent was £530. If the law had been resorted to, the town would have stood to lose the £500, without counting legal expenses, in order to gain the paltry amount of £30.

MISCELLANEOUS NEWS.

THE LONDON COUNTY COUNCIL AND GAS AND WATER SUPPLY.

Gas Testing—The Council and the Water Board.

At the Meeting of the London County Council on Tuesday, a long report was presented by the Public Control Committee on the subject of gas testing in the Metropolis.

PROCEEDINGS AGAINST COMPANIES.

The first portion of the report dealt with the time within which the Council may take proceedings against gas companies for deficiencies in illuminating power, and suggested an amendment of the existing legislation in regard thereto. The Committee recited the circumstances which had prompted them in making the suggestion, which were as follows.

On March 24, 1902, the Magistrate at the Bow Street Police Court decided that the Gaslight and Coke Company had incurred a forfeiture for supplying gas at the testing-place in Spring Gardens, on the 7th of January, of deficient illuminating power. At the hearing, the point was raised, on behalf of the Company, that, inasmuch as the offence was committed on the 7th of January, and the information had not been laid before the Magistrate until the 10th of March, the Council's proceedings were out of time, under section 18 of the Gaslight and Coke and Other Gas Companies Acts Amendment Act, 1880, which prescribes that, on proof of the gas examiner's report within one month after the date of the report, the Magistrate shall issue his warrant of distress against the Company. It was contended, on behalf of the Council, that their proceedings were not taken under section 18 for the issue of a distress warrant, but under section 20 of the same Act for the recovery of the forfeiture of 40s., to which the Company were liable; and that, under the provisions incorporated with this latter section, six months was the limit within which proceedings might be taken. The Magistrate agreed with the Council's contention, as other Magistrates had done in previous cases where the point had been raised, and over-ruled the objection of the Company; but, on their application, he consented to state a case for the opinion of the High Court.

A case was accordingly stated by the Magistrate, and on Oct. 31, 1902, it was heard in the Divisional Court before the Lord Chief Justice and Justices Wills and Channell. After hearing the arguments on both sides, the Lord Chief Justice, in giving judgment, said the question was one of great difficulty, as, owing to the manner in which section 18 of the Act of 1880 had been framed, it was difficult to determine the intention of the Legislature. If he could see that a conviction against the Company would be of any advantage without a distress warrant, he would be inclined to hold that the Magistrate was right; but as a conviction would have to be enforced by a distress warrant simply, and not by imprisonment, there was nothing to be gained by a conviction. He must give some effect to the words of section 18; and he came to the conclusion that proceedings must be taken within one month. He therefore reversed the decision of the Magistrate, with costs. Mr. Justice Wills and Mr. Justice Channell concurred.

It having thus been decided that the report of a gas examiner, or the report of the Chief Gas Examiner on appeal, must be proved before the Magistrate within one month to render the Company liable to a forfeiture, the Committee's attention was called to the fact that a gas company might enter an appeal and withdraw it on or before the day appointed by the Chief Gas Examiner for the hearing. In these circumstances, there would be no report of the latter within the meaning of the Acts, and the Council would then have to fall back upon the report of the gas examiner, which might then be over a month old; and, consequently, in view of the decision of the High Court, the Council could not successfully take proceedings against the Company.

The Committee consulted Counsel in the matter, and he advised that gas companies could not, in the present state of the law, be prevented from withdrawing an appeal, and that it was doubtful whether the Chief Gas Examiner could, under section 12 of the Gaslight and Coke and Other Gas Companies Acts Amendment Act, 1880, make an effective or valid report when an appeal had been withdrawn and he had not, in fact, heard the parties. In view of this opinion, the Committee considered that steps should be taken as soon as possible to obtain an amendment of the Act; and they accordingly recommended—"That the Parliamentary Committee be instructed to include a clause or clauses in one of the Council's Bills for the session of 1904, with the object of amending the Gaslight and Coke and Other Gas Companies Acts Amendment Act, 1880, in order that the time within which the Council shall take proceedings be not limited to one month, and to increase the powers of the Chief Gas Examiner."

EXPERIMENTAL GAS TESTING BY THE CHEMIST.

The next matter dealt with by the Committee related to recent events in connection with the testing of gas in London. They reminded the Council that on the 10th of March they approved of the action taken by the Parliamentary Committee in asking the President of the Board of Trade to appoint a Departmental Committee to consider the question of the method by which gas should be tested, which was raised in connection with several Bills before Parliament, introduced by the Council or the Gas Companies. The Board of Trade had decided to appoint such a Committee; and in order that the Council might be in a position to lay before them the results obtained by actual experiments, showing the difference in testing the gas by the method prescribed by section 6 of the South Metropolitan Gas Act, 1900, and the mode prescribed by the Metropolitan Gas Referees, it was proposed to obtain a small gas plant and two holders, so that the Chemist might be in a position to make the necessary experiments, and thus be able to give the evidence required.

The Committee said they were also obtaining evidence with regard

to the calorific value of the gas supplied; and the proposed gas plant would greatly assist the Chemist in carrying out his investigations on this subject. They therefore recommended—"That an expenditure not exceeding £200 be authorized for the purchase of a small gas plant and two small gasholders." This was agreed to.

Testing Gas on Sundays.

The above subject was the next to engage the attention of the Committee. They pointed out that, as the South Metropolitan Gas Company had prevented the Council's gas examiners from testing the gas at the prescribed testing-places in their districts on Sundays, the Council had authorized the Committee to take all necessary legal steps to secure that such testing should be carried out. The action was tried in the High Court before Mr. Justice Joyce on May 4, 1903, when he held that the word "daily" in the section of the Gaslight and Coke and Other Gas Companies Acts Amendment Act, 1880, meant every day, and that the intention of the section was that the testing should be daily, and should be every day, without excepting Sunday in any way whatever. He accordingly gave judgment for the Council, with costs. Having regard to this decision, the Council's gas examiners attended at the testing-places to test the gas on Sunday, May 24 last; but the Company, after due notice, again prevented the examiners from making the tests. An injunction was therefore obtained to restrain the Company from interfering with the gas examiners; but the Company appealed against this decision, and the Court of Appeal suspended the operation of the order pending the hearing of the appeal.* The Council, on March 31 last, authorized the gas supplied by the Gaslight and Coke Company and the Commercial Gas Company to be tested on Sundays and Bank Holidays for a period not exceeding three months; and the Committee thought these tests should be continued pending a decision in the action against the South Metropolitan Gas Company, but for not exceeding six months, at the end of which period they would report further. The estimated cost was £185; and they had provided for this expenditure in the estimates. They recommended—"That the Public Control Committee be authorized to arrange for the gas supplied by the Gaslight and Coke Company and the Commercial Gas Company to be tested on Sundays and Bank Holidays by relieving gas examiners at the prescribed testing-places, pending a decision in the action against the South Metropolitan Gas Company, or for a period not exceeding six months, at an estimated cost of £185." The recommendation was agreed to.

Tests by the Portable Photometer.

The Committee submitted the following table, showing the results of tests (201 in all) made with the portable photometer during the year ending the 31st of March.

Tests showing Illuminating Power of the Gas to be—	Gaslight and Coke Company.		South Metropolitan Gas Company.		Commercial Gas Company.	
	(*a*)	(*b*)	(*a*)	(*b*)	(*a*)	(*b*)
Above 16 candles	49	67	..	..	10	36
Between 15·5 and 16·0 candles	19	25	..	..	13	46
,, 15·0 ,, 15·5 ,,	5	7	..	..	4	14
,, 14·5 ,, 15·0 ,,	1	1	..	..	1	4
Above 14 candles	..	..	51	52	..	..
Between 13·5 and 14·0 candles	..	..	33	33	..	..
,, 13·0 ,, 13·5 ,,	..	..	12	12	..	..
,, 12·5 ,, 13·0 ,,	..	..	3	3	..	..
	74		99		28	
	Aver. 16·22 c.		Aver. 14·26 c.		Aver. 15·93 c.	

Notes.—(*a*) Number. (*b*) Approximate percentage of the whole. The standard for the Gaslight and Coke Company is 16 candles; for the South Metropolitan Gas Company, 14 candles; and for the Commercial Gas Company, 16 candles to Dec. 31, 1902, and 14 candles after.

Opposition to the Crystal Palace Gas Bill.

The *agenda* for the meeting of the Council to-day contains a report by the Parliamentary Committee on the result of the proceedings on the above-named Bill. After indicating the nature of the powers sought, the Committee state that the Council's opposition was directed to all the points specified. In the result, their contentions were upheld by the Select Committee, who decided to reduce the illuminating power of the gas to 14 candles only, instead of 13 candles as asked; to allow 1d. off the minimum standard price of the neutral zone for this reduction, instead of ½d. as proposed; to retain the provisions of the Acts of 1873 and 1893 in regard to the purification of gas from sulphur compounds, subject to any decision which might be arrived at at the departmental inquiry by the Board of Trade on gas testing; and to continue the present system of testing gas prescribed by the Act of the last-named year. This resulted, the Committee point out, in the whole question of testing being left open for inquiry before the Departmental Committee. They add that since this decision was announced, the Company have withdrawn the whole of the provisions affected by the Committee's decision. Powers still remain, however, with regard to the acquisition of certain lands; and clauses as to street widening and the application of the London Building Acts have been agreed.

The Council and the Water Board.

The General Purposes Committee reported that the Metropolitan Water Board had requested the assistance of Mr. Haward, the Council's Comptroller, and the loan of papers relating to the London Water Supply. With regard to the former request, the Committee said they felt sure it would be the desire of the Council to meet the wishes of the Board as far as possible. But, before submitting a recommendation, they thought it necessary to have definite information as to the nature of the assistance the Comptroller would be asked to give.

* These proceedings have been recently reported in the "Journal."

MANCHESTER CORPORATION GAS SUPPLY.

Annual Report and Accounts.

We have received from the Superintendent of the Manchester Corporation Gas Department (Mr. Charles Nickson) a copy of the report of the Gas Committee, with an abstract of the accounts for the year ending March 31. The Committee record the progress of the undertaking as follows.

The number of tons of coal and cannel carbonized, including the equivalents of enriching materials, and the quantity of gas and residual products made per ton carbonized, as compared with the previous year, is as follows:—

	Coal and Cannel Carbonized. Tons.	Gas per Ton. Cub. Ft.	Coke per Ton. Cwt.	Coke for Sale per Ton. Cwt.	Tar per Ton. Gallons.	Am. Liq. per Ton. Galls. (10 oz.)
1903.	448,909	10,778	13·09	9·29	11·70	27·87
1902.	456,727	10,663	12·63	8·69	12·13	29·66

The quantity of carburetted water gas produced during the year was 923,814,000 cubic feet, compared with 795,045,000 cubic feet in the previous year. In the production of this gas, 3,170,464 gallons of oil and 18,038 tons of coke were used, compared with 2,846,940 gallons and 16,476 tons respectively for the year ending March 31, 1902.

The illuminating power of the gas sent from the works was equivalent to 18·25 standard sperm candles, against 18·54 candles for the year 1901-2.

The quantity of gas transmitted from the works shows a decrease of 33,493,000 cubic feet, or 0·69 per cent., compared with an increase of 136,669,000 cubic feet, or 2·89 per cent., in the year 1901-2. The tota output and quantity unaccounted for, compared with the previous year, is as follows:—

	Gas Sent Out. Cub. Ft.	Unaccounted For. Cub. Ft.	Percentage of Loss.
1903	4,837,001,000	157,415,000	3·25
1902	4,870,494,000	155,814,000	3·20

The number of gas consumers on March 31, 1902 and 1903, was respectively as follows:—

	Within the City.	Beyond the City.	Total.
1903	113,827	28,127	141,954
1902	110,085	26,835	136,920
Increase in 1903.	3,742	1,292	5,034

The percentage of private consumption was as follows:—

	1902. Per Cent.	1903. Per Cent.
Within the City—Ordinary consumers	76·98	76·08
Prepayment ,,	6·42	7·20
Outside the City—Ordinary ,,	16·00	16·00
Prepayment ,,	0·60	0·72
	100·00	100·00

The number of automatic meters in use at the end of the financial year was 41,865, compared with 38,495 in the previous year—an increase of 3370, of which 2835 were fixed in the city and 535 in the outtownships. There were also fixed in connection with these meters 13,488 grillers. The quantity of gas passed by these meters was 336,221,000 cubic feet—an increase of 33,112,000 cubic feet, or 10·92 per cent., on the previous year. The meters were inspected once in every five weeks; and the total sum collected from them during the year was £47,131 16s. 6d. This amount is represented by 11,311,638 pennies, weighing 100 tons 19 cwt. 3 qrs. 20 lbs.

The number of gas cookers and other appliances on hire at March 31 was 12,803, compared with 12,930 for the year ending March 31, 1902. The quantity of gas consumed by cookers, fires, &c., is estimated at 258,000,000 cubic feet; being an increase of 3·2 per cent. on the figures for 1901-2. On the 31st of March last, gas for motive power purposes was being used by 1520 engines, at the reduced rate of 2s. per 1000 cubic feet. The quantity of gas consumed by these engines since the reduction in price, from Sept. 30, 1902, was 170,033,000 cubic feet.

The following is a summary of the income and expenditure:—

Income.

	1902.	1903.
Gas sold, including stove-rents	£648,736	£644,818
Coke	62,137	68,886
Tar	23,887	29,893
Ammoniacal liquor and sulphate of ammonia	27,518	29,279
Sundry receipts	932	1,050
	£763,210	£773,926

Expenditure.

	1902.	1903.
Manufacture—		
Coal, cannel, and oil	£332,771	£277,280
Salaries, wages, and maintenance	138,076	132,927
Distribution—		
Salaries, wages, and maintenance	72,710	71,915
Management—		
Salaries and wages	4,438	4,585
Do. do. (collection)	8,848	9,039
General management expenses	8,228	7,995
Rents, rates, and taxes	44,030	47,702
	£609,101	£551,443

The cost of coal, cannel, and oil per ton carbonized fell to 12s. 4·24d., against 14s. 6·86d. for the previous year; while the receipts for residual

products rose to 5s. 8·46d. per ton, compared with 4s. 11·66d.—representing a saving of 2s. 11·42d. per ton in the net cost of raw material, which, on the total carbonization of 448,909 tons, amounts to £66,251.

The gross profit on the year's working was £222,482 17s. 9d. The sum of £43,633 3s. 2d. was paid for interest, and £45,371 2s. 4d. has been placed to the sinking fund (as required by the Acts of Parliament under which the money is borrowed). The net profit, therefore, amounted to £133,478 12s. 3d. This sum, together with £1102 10s. received from the Stockport Corporation in consideration of the transfer of the Reddish gas supply, making together £134,581 2s. 3d., has been appropriated as follows :—

Paid over to City Fund	£50,000 0 0
Extension of carburetted water-gas plant	2,941 12 2
Do. chemical works	8,966 4 8
Placed to contingent fund account	72,673 5 5
	£134,581 2 3

The price of gas to ordinary consumers during the year was 2s. 9d. per 1000 cubic feet within the city, and 3s. per 1000 cubic feet without the city; but it has been reduced by 3d. per 1000 cubic feet as and from June 24 last, in accordance with the resolution of the City Council of May 20. The price of gas used for motive power purposes was reduced to 2s. per 1000 cubic feet within the city, and to 2s. 3d. per 1000 cubic feet without the city, as and from Sept. 30, 1902, in accordance with the resolution of the Council of May 7, 1902.

The following table shows the expenditure on capital and renewals accounts :—

	Capital.	Renewals.
Gaythorn	£796 8 3 ..	£4,801 12 5
Rochdale Road	6,459 9 3 ..	5,794 10 0
Bradford Road	13,381 13 0 ..	410 6 4
Droylsden	— ..	96 14 7
Street mains stores—		
Poland Street	3,297 8 4 ..	—
Whitworth Street	191 10 9 ..	—
Mains	4,604 0 6 ..	6,169 11 4
Services	7,848 0 0 ..	2,757 8 1
Meters	16,985 3 0 ..	11,987 18 11
Stoves	— ..	3,002 1 4
	£53,563 13 1	£35,020 3 0

The following extensions and renewals of works were carried out during the year :—

Gaythorn Station.—The old boiler-house at this station has been converted into a mechanics' shop, and equipped with a 20 break-horse-power gas-engine, lathe, and drilling machine, and the existing machinery in the smithy removed there. The coke-conveying plant within the No. 2 retort-house has been renewed, and Woodward's patent coke elevating, storing, and loading plant erected in the yard. With this plant, the loading of carts will be more expeditiously carried out than formerly, and the production of breeze considerably lessened. The Nos. 1, 2, 3, and 4 cable-guided gasholders have been overhauled and repaired. The roof of "A" section purifier-house has been stripped, and the purlins and slates renewed. A set of twin exhausters and steam-engine of a capacity of 150,000 cubic feet of gas per hour have been erected to replace an old set of the same capacity.

Rochdale Road Station.—The work of reconstructing this station, in accordance with the Engineer's report of June, 1900, is making satisfactory progress, considering that it is necessary that the work should be carried out so as not to interfere with the output of gas from this station. The following work in connection with the scheme has been completed—viz: Foremen's offices, extension of "B" section of purifiers, concentration of washing and scrubbing plant, and new joiners' shop. The work in progress is as follows: The "A" section of purifiers have been removed, and the site is in course of preparation for the new exhauster-house. The roof of the "D" retort-house has been taken down, and the walls raised and prepared for the new roof. The water-tube condensers have been taken down to make way for the new stores, and are being re-erected on a new site adjoining the washing and scrubbing plant.

Bradford Road Station.—The foundations for the new purifier extension have been completed during the year, and the contractors are engaged in the erection of the steel staging to carry the purifiers. The first four sections of carburetted water-gas plant erected have been fitted with safety interlocking valve gear, &c., in order to mimimize the risk of accident. Two steel tar-settling tanks have been erected in connection with the carburetted water-gas plant, of a capacity of 120,000 gallons each. A new 30-inch station governor has been fixed at this station, and the remaining station governors overhauled and repaired.

Droylsden Station.—At this station the purifiers have been overhauled and repaired.

Street Mains and Lighting Department.—The total length of mains now laid is 1,463,206 yards, or 831¼ miles and 206 yards; being an increase of 7¾ miles and 439 yards during the year. The total number of public lamps fitted with incandescent burners at March 31 last, was 1580, compared with 818 for the previous year. During the year a commencement was made in the system of attaching public lamps to the tramway trolley poles, and this system will be gradually extended to all tramway routes within the city.

Supply of Gas to the District of North Reddish.—The district of North Reddish, which has hitherto been supplied with Manchester gas, having been incorporated in 1901 into the county borough of Stockport, negotiations took place with the Stockport Corporation as to a transfer of the gas supply to the area in question. As the result, the property of the Manchester Corporation in the portion of North Reddish above referred to—comprising gas-mains, service-pipes, meters, and stoves—has been sold to, and acquired by, the Stockport Authority for the total sum of £1781 19s. 1d. This amount includes £1102 10s., the profits, calculated on a 25 years' basis, derived from the surrendered district.

Stoves Department.—The following is a summary of the past year's transactions compared with the previous year :—

	1902.	1903.
Number of articles sold	1778 ..	1862
New stoves purchased for hire	1212 ..	238
Stoves issued on ordinary hire (including new stoves and re-issues)	3886 ..	3151
Stoves issued on the hire-purchase system	21 ..	26
Stoves cleaned and repaired	2608 ..	2886
Number of grillers fixed in connection with pre-payment meters	5683 ..	6224
Cookers fixed to prepayment meters	— ..	83
Number of grillers cleaned	— ..	708

In addition to the usual renewal of retorts, the whole of the works and plant of the department were kept in good repair and working condition out of the year's income.

Accompanying the report are the accounts, with the usual appendices, from which we take the following particulars :—

REVENUE ACCOUNT.

INCOME.

Gas-rental—		
Ordinary meters		£539,152 11 7
Prepayment meters		47,131 16 6
Public lamps		51,642 12 1
Stove-hire		6,891 3 10
Residual products—		
Coke	£68,886 9 6	
Tar	29,892 19 11	
Sulphate of ammonia	23,278 16 11	
Carbon	323 12 0	
		128,381 18 4
Rents of cottages, &c.		725 19 5
		£773,926 1 9

EXPENDITURE.

Cannel, coal, and carburine (including cost of unloading, &c.)	£242,327 3 3
Carbonization (retort men's wages, &c.)	41,528 10 4
Retorts, fire-bricks, &c. (including cost of setting)	10,715 15 6
Repairs and maintenance of works, mains, &c.	69,778 3 2
Renewals of plant, &c.	35,020 3 0
Purifying material and wages	2,865 19 6
Carburetted water gas	52,180 15 1
Salaries and wages of clerks in Superintendent's office, rental and inquiry offices, and meter inspectors	32,234 11 6
Collectors', receivers', and cashiers' salaries	9,038 12 4
Rents, rates, and taxes	47,701 16 8
Compensation under Workmen's Compensation Act, 1897	56 7 11
Bad debts written off	1,039 8 6
Miscellaneous expenses	6,955 17 3
	£551,443 4 0
Balance carried to the profit and loss account	222,482 17 9
	£773,926 1 9

PROFIT AND LOSS ACCOUNT.

Interest	£43,633 3 2
Sinking funds	45,371 2 4
Balance (net profit on the year's working)	133,478 12 3
	£222,482 17 9

To the balance of net profit has to be added £1102 10s. received from the Stockport Corporation; making £134,581 2s. 3d. This is disposed of as follows :—

Amount paid over to the city fund account		£50,000 0 0
Applied in extension of works where borrowing powers are not granted—		
Carburetted water-gas plant	2,941 12 2	
Chemical works	8,966 4 8	
Placed to contingent fund account	72,673 5 5	
	£134,581 2 3	

The accounts are followed by the usual appendices, furnishing particulars in regard to the progress of the undertaking.

Appendix A is a comparative statement of the gas transmitted from the works in the daytime and during the twenty-four hours, for the past two years. Summarized, the figures are as follows :—

	Daytime. Cubic Feet.	Twenty-four Hours. Cubic Feet.
Year ended March 31, 1903	1,402,383,000 ..	4,837,001,000
Do. Do. 1902	1,435,034,000 ..	4,870,494,000
Decrease	32,651,000 ..	33,493,000

	Cubic Feet.
Gas transmitted from the Works	4,837,001,000
Do. accounted for	4,679,586,000
Loss (by condensation and leakage)	157,415,000 or 3·25 per cent.

In Appendix B, particulars are given as to the results of the working from March 31, 1883, to March 31, 1903. The table contains statistics as to the number of tons of coal and cannel carbonized, the total make of gas, the percentage unaccounted for, the yield per ton of coal, the illuminating power of the gas, the quantity of residual products, &c., for each year in the above-mentioned period. The particulars for the past financial year are as follows: Coal and cannel carbonized, 448,909 tons; gas made, 4,838,636,000 cubic feet; yield per ton of coal carbonized, 10,778 cubic feet; illuminating power, 18·25 candles; make reduced to 20-candle power, 4,415,255,000 cubic feet; make per ton, 20-candle power, 9835 cubic feet; percentage of output unaccounted for, 3·25; make of coke, 240,736 tons; do. per ton of coal, 13·09 cwt.; make of tar, 25,114 tons; do. per ton of coal, 11·70 gallons; ammoniacal

liquor (10-oz. strength) made, 10,252,539 gallons; do. per ton of coal, 27·87 gallons; sulphate made, 3306 tons; do. per ton of coal, 22·24 lbs.

Appendix C shows the number of stoves on hire and of each size of meter in use during the year in the city and out-townships. At the close of the past financial year, there were 8100 stoves on hire within, and 4703 beyond the city—together, 12,803, compared with 8295, and 4635 (together, 12,930) at the corresponding date in 1902; so that there was a decrease of 127. The number of meters in use was 141,954 in 1903 and 136,920 in 1902. There was last year a net increase of 5034 on the number for the preceding year. Of the total number at work on March 31 last, 137,540 were on hire, as compared with 131,897 at the close of the financial year 1901-2. The number of prepayment meters on hire on March 31 last was 41,865—an increase of 3370 on the number at the close of the preceding year.

From Appendix D, we learn that the gas-mains laid last year within the city extended to 18,700 yards, and beyond the city to 8015 yards—a total of 26,715 yards, or 15 miles 315 yards. The mains taken up were 9488 and 3148 yards respectively—a total of 12,636 yards, or 7 miles 316 yards. The total net increase during the year, therefore, was 14,079 yards, or 7⅞ miles 439 yards. The total length of mains laid up to March was 1,463,206 yards, or 831¼ miles 206 yards.

Appendix E is an abstract of the capital, revenue, and profit and loss accounts. It shows (*inter alia*) the amount of gross profit made from the gas undertaking, and the mode of its appropriation, also the amount of borrowed money owing, excess of assets, &c., from June 24, 1883, to March 31 last. The figures for the past financial year are as follows: Profit, £222,482; paid over for improvement purposes, £50,000; applied in extension of works, £11,907; borrowed money owing, £1,201,852; and excess of assets, £1,356,231. The profit of £222,482 is appropriated thus; Interest, £44,875 (including amount charged to sulphate of ammonia); liquidation of mortgage debt, £46,467 (do.)—net profit, £133,478. From June 24, 1843, the date when the works were taken over by the Corporation from the Commissioners of Police, the gross profits on the gas undertaking have amounted to £5,108,315, out of which £1,187,800 has been paid for interest, and £1,146,208 placed to the sinking fund; leaving the net profit £2,776,645. Of this total, £2,230,100 has been handed over to the Improvement Committee and added to the city fund, £329,201 has been paid for street lighting (making £2,559,301 used in relief of the rates), and £94,604 applied in the extension of works for which no borrowing powers have been granted. The bulk of the last item (£82,067) has been expended on the installation of carburetted water-gas plant, and £8966 has been employed in the establishment of chemical works.

The report and accounts were before the Gas Committee on Monday last week, when the Chairman (Alderman Gibson) directed attention to the fact that the gross profit made by the department in the last twenty years was £2,434,905, which had been thus disposed of: Interest on loans, £640,345; sinking fund, £493,959; paid to the city fund in relief of rates, £1,087,814; extension of works, £94,604; and contributions to the contingent fund, £122,183. In 1902, the liabilities of the department reached £1,415,593, while in the present year (on March 31) they were £1,327,666, or a decrease of £87,927; and the excess of assets in 1903 over those of 1902 was £131,049, or an increase of 10·69 per cent. The accounts were passed.

GAS-WORKS EXTENSIONS AT MANCHESTER.

Local Government Board Inquiry.

An inquiry was held at the Manchester Town Hall last Friday by Colonel A. G. Durnford, of the Local Government Board, into an application by the City Council for sanction to borrow £253,570 for the purposes of the gas-works undertaking. There was no opposition to the proposal.

The Chairman of the Gas Committee (Alderman Gibson) and the Deputy-Chairman (Alderman Briggs) stated that the money was needed to meet the increasing business of the undertaking; the former giving it as his opinion that the loan, if sanctioned, should be made repayable, as regarded new works at the three stations, in 30 years, as regarded mains and services in 25 years, and as regarded meters and stoves in 10 years. The Gas Engineer (Mr. J. G. Newbigging) said the expenditure was necessary for the efficient and economical working of the department. Compared with five years ago, the quantity of gas made had increased by 8·52 per cent.; the quantity made during the year ended March, 1899, being 44,58 million cubic feet, against 4838 millions for the year ending last March. This increase would have been much greater but for the mild winters experienced in this period, and the fact that during the past winter Manchester enjoyed an entire immunity from fog. A single severe winter might easily increase the consumption by 10 per cent. The reduction in the price of gas for motive power, and the abolition of rental for cooking-stoves, would have a marked effect on the consumption for these purposes in future. The present consumption of gas for motive power and cooking was about 10 per cent. of the entire output. The total cost of the new works at Gaythorn was estimated at £47,200, at Rochdale Road £16,850, and at Bradford Road £49,337. In new mains it was intended to spend £25,550, in new services £24,000, in new meters £48,000, and in new stoves £42,633; making a grand total of £253,570. The Superintendent (Mr. Charles Nickson) said the area of supply was 46½ square miles, and the population 730,000. The number of consumers in 1892 was 80,571; in 1896 it had risen to 112,263; and at present it was 141,954. In 1892 the length of mains was 691½ miles; six years later it was 767 miles; and in the present year it was 823 miles. The number of prepayment meters had risen from 22,761 in 1898 to 41,865 in 1903; while the number of ordinary meters in use had increased from 89,502 to 100,089. The charge for

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 92.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
590,000	10	April 17	10½	Alliance & Dublin 10 p.c.	19—20	..	5 5 0
100,000	10	,,	7½	Do. 7 p.c.	13—14	..	5 7 2
200,000	5	May 14	6½	Bombay, Ltd.	5½—6	..	5 8 4
140,000	5	,,	6½	Do. New, £4 paid	4—4½	..	5 15 7
380,000	Stk.	Feb. 26	12	Brentford Consolidated	240—245	..	4 18 0
286,700	,,	,,	9	Do. New	178—183	..	4 18 4
50,000	,,	,,	5	Do. 5 p.c. Pref.	131—136	..	3 13 6
206,250	,,	June 11	4	Do. 4 p.c. Deb.	108—111	..	3 12 1
220,000	Stk.	Mar. 12	10½	Brighton & Hove Orig.	212—217	..	4 19 1
246,320	,,	,,	7½	Do. A. Ord. Stk.	151—156	..	4 19 4
460,000	20	Mar. 31	10	British	39½—40½	..	4 18 9
100,000	Stk.	Mar. 12	6	Bromley, 5 p.c. "A"	118—123	..	4 17 7
165,700	,,	,,	4½	Do. 3½ p.c. "B"	90—95	..	4 14 9
500,000	10	May 14	7	Buenos Ayres (New) Ltd.	10⅝—11¼	..	6 4 5
250,000	Stk.	June 26	4	Do. 4 p.c. Deb.	93—95	..	4 4 3
150,000	20	July 10	8½	Cagliari, Ltd.	22—24*	..	6 17 6
100,000	10	June 11	10	Cape Town & Dis., Ltd.	14½—15½	..	6 9 0
50,000	50	May 2	6	Do. 6 p.c. 1st Mort.	52—54	..	5 11 1
1,375,000	Stk.	Feb. 26	5	Commercial 4 p.c. Stk.	103—106	..	4 14 4
503,750	,,	,,	4⅝	Do. 3½ p.c. ,,	98—101	..	4 14 1
407,812	,,	June 11	3	Do. 3 p.c. Deb.,	87—90	..	3 6 8
800,000	Stk.	June 11	7	Continental Union, Ltd.	125—130	..	5 7 8
200,000	,,	,,	7	Do. 7 p.c. Pref.	137—142	..	4 18 7
575,000	Stk.	Feb. 26	5½	Crystal Palace Ord. 5 p.c.	113—118	..	4 10 2
60,000	,,	,,	5	Do. 5 p.c. Pref.	120—125	..	4 0 0
106,158	,,	July 10	5	Do. 5 p.c. Deb. Stk.	135—138*	..	3 12 6
486,090	10	Jan. 29	10½	European, Ltd.	18—19	..	5 10 6
354,060	10	,,	10⅝	Do. £7 10s. paid	13—14	..	5 12 6
15,243,200	Stk.	Feb. 12	4½	Gas-light and Coke — 4 p.c. Ord.	83—85	—1	5 3 6
2,600,000	,,	,,	3⅜	Gas-light and Coke — 3½ p.c. max.	85—87	..	4 0 6
3,799,735	,,	,,	4	Gas-light and Coke — 4 p.c. Con. Pref.	107—109	..	3 13 5
4,193,975	,,	June 11	3	Gas-light and Coke — 3 p.c. Con. Deb.	87—89	—1	3 7 5
252,500	Stk.	Mar. 12	5	Hastings & St. L. 3½ p.c.	90—95	..	5 5 3
70,000	10	June 11	8	Hongkong & China, Ltd.	15—16	..	5 0 0
3,800,000	Stk.	May 14	10	Imperial Continental	203—206	—1	4 17 1
473,600	Stk.	Feb. 12	3½	Do. 3½ p.c. Deb. Red.	100—103	..	3 8 0
165,242	Stk.	Mar. 12	6	Lea Bridge Ord. 5 p.c.	115—120	..	5 0 0
561,000	Stk.	Feb. 26	10	Liverpool United A	218—220	..	4 10 11
718,100	,,	,,	7	Do. do. B	166—168	..	4 3 4
306,083	,,	June 26	4	Do. do. Deb. Stk.	110—112	..	3 11 5
75,000	5	June 11	5	Malta & Medn., Ltd.	4¼—4⅝	..	5 5 3
560,000	100	April 1	5	Met. of — 5 p.c. Deb.	103—107	..	4 13 6
250,000	100	,,	4½	Melbourne — 4½ p.c. Deb.	102—104	..	4 6 7
541,920	20	June 11	3½	Monte Video, Ltd.	9—10	—½	7 0 0
1,515,892	Stk.	Feb 20	4½	Newc'tle & G'tesh'd Con.	104—105	..	4 5 9
376,855	Stk.	July 3	3½	Do. 3½ p.c. Deb.	95—99*	+2	3 10 8
300,000	Stk.	May 14	8	Oriental, Ltd.	140—145	..	5 10 4
600,000	5	Mar. 31	7	Ottoman, Ltd.	6—7	..	5 0 0
205,005	Stk.	June 26	6½	Ply'mth & St'house 5 p.c	123—128	..	4 15 8
851,070	10	April 30	7	River Plate Ord.	10¾—11¼	..	6 4 5
300,000	Stk.	June 26	4	Do. 4 p.c. Deb.	94—96	..	4 3 4
250,000	10	April 17	8	San Paulo, Ltd.	11⅞—12½	..	6 8 0
135,000	Stk.	Mar. 12	10	Sheffield A	239—241	..	4 3 0
209,984	,,	,,	10	Do. B	237—240	..	4 3 4
523,498	,,	,,	10	Do. C	236—238	—1	4 4 0
103,235	Stk.	Mar. 31	5	Shrewsbury Ord. 5 p.c.	111—114	..	4 7 9
6,000,000	Stk.	Feb. 12	5⅜	South Met., 4 p.c. Ord.	120—123	..	4 6 8
1,780,000	,,	July 10	3	Do. 3 p.c. Deb.	89—91*	+½	3 5 11
380,940	Stk.	May 14	5	Southampton Ord.	105—110	..	4 10 11
87,950	,,	July 10	4	Do. 4 p.c. Deb.	102—105*	+1	3 16 2
120,000	Stk.	Feb. 26	6	Tottenham and Edmonton — A. 5 p.c.	117—122	..	4 18 4
300,520	,,	,,	4½	Tottenham and Edmonton — B. 3½ p.c.	96—99	..	4 10 11
182,380	10	June 11	8	Tuscan, Ltd.	8—9	..	8 17 10
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	98—100	..	5 0 0
730,872	Stk.	Mar. 12	5	West Ham, 5 p.c. Ord.	95—100	..	5 0 0
				WATER COMPANIES.			
780,776	Stk.	June 26	11⅓	Chelsea, Ord.	320—330	..	3 9 8
150,000	,,	,,	5	Do. 5 p.c. Pref.	147—150	..	3 6 8
160,000	,,	,,	4½	Do. 4½ p.c. Pref. '75	135—138	..	3 5 3
175,785	,,	Mar. 31	4½	Do. 4½ p.c. Deb.	137—142	..	3 3 5
1,720,560	Stk.	Mar. 31	8	East London, Ord.	243—248	..	3 4 6
654,740	,,	June 11	4½	Do. 4½ p.c. Deb.	138—143	..	3 2 11
1,282,943	,,	,,	3	Do. 3 p.c. Deb.	93—96	..	3 2 6
700,000	50	June 11	10	Grand Junction — 10 p.c. max.	140—145	..	3 9 0
310,000	Stk.	Mar. 31	4	Grand Junction — 4 p.c. Deb.	123—128	..	3 2 6
708,000	Stk.	Feb. 26	10½	Kent	300—310	..	3 7 9
160,000	,,	,,	7	Do. New, 7 p.c. max.	200—210	..	3 6 8
1,043,800	100	June 26	11	Lambeth, 10 p.c. max.	310—320	..	3 8 9
406,200	100	,,	8½	Do. 7½ p.c. max.	220—230	..	3 13 11
350,000	Stk.	Mar. 31	4	Do. 4 p.c. Deb.	122—127	..	3 3 0
500,000	100	Feb. 12	12⅝	New River, New Shares	430—440	..	2 18 2
1,000,000	Stk.	Jan. 29	4	Do. 4 p.c. Deb.	123—128	..	3 2 6
902,300	Stk.	June 11	7½	Southwark and Vauxhall — Ord.	275—280	—1	2 13 7
126 500	100	,,	7½	Southwark and Vauxhall — 7½ p.c. max.	210—220	..	3 8 2
489,200	Stk.	,,	5	Southwark and Vauxhall — 5 p.c. Pref.	148—153	..	3 5 4
1,019,585	,,	Mar. 31	4	Vauxhall — 4 p.c. A Deb.	122—127	..	3 3 0
1,155,066	Stk.	June 11	10	West Middlesex	300—305	—3	3 5 7
200,000	,,	,,	4½	Do. 4½ p.c. Deb.	136—141	..	3 3 10
200,000	,,	Mar. 12	3	Do. 3 p.c. Deb.	94—96	..	3 2 6

* Ex div.

* Ex div.

the hire of cooking-stoves had been abolished. On June 30, there were 12,833 of these stoves in use—an increase of 859; but after the new arrangements were decided upon and made known (April 22 to June 30), the number of applications was 2285. Applications were coming in at an average rate of 41 per working day. The number of gas-engines in use at the present time was 1520; and it was estimated that these consumed about 350 million cubic feet of gas per annum. During the ten years 1892-1902, there was an increase of 70 per cent. in the number of consumers. The financial position of the gas undertaking at the end of March was as follows: Assets, £2,683,897; liabilities, £1,327,666; excess of assets, £1,356,231, as compared with £865,206 in the preceding year. Improvements are also to be made in the facilities for handling the materials used in gasmaking; and at the Gaythorn station there is to be a new retort installation.

GAS-WORKS PURCHASE AT BALLYMENA.

Local Government Board Inquiry.

Last Tuesday, Mr. A. D. Price, of the Local Government Board, attended at Ballymena for the purpose of holding an inquiry into the application of the Urban District Council for a loan of £29,000 to enable them to purchase and extend the local gas-works. There was no opposition. The Town Clerk and Surveyor (Mr. Henry O'Hara) stated that the amount asked for included interest on the purchase money from Jan. 1 last, the cost of the Provisional Order and of the arbitration, and the necessary money for laying new mains and providing a station meter. A new boiler would also be necessary, as the existing one was insufficient for the work required of it, and was very old. The Manager (Mr. W. Nisbet) said he considered the new mains specified—600 yards of 4-inch, and 300 yards of 3-inch—were necessary, as there had been a number of complaints. It was also absolutely essential that they should have the station meter and boiler. The plant was not in good order, and a number of improvements in it could be made. The present charge for gas was 4s. 7d. per 1000 cubic feet. Mr. H. Rainey, one of the councillors present at the inquiry, asked whether anything could be said with regard to their obtaining the loan on reasonable terms, seeing the large sum they had to pay for the gas-works. The question of price was left to Arbitrators; and unfortunately the figure they had arrived at (£25,926) was higher than had been expected. They were therefore very anxious that the Local Government Board should consider this matter in granting the loan. The ratepayers did not wish to put all the expense on the present generation, but wanted the loan for as long a time as possible. The Inspector said he thought that twenty years was the maximum time allowed for the repayment of such a loan; but whether or not the Treasury would be satisfied to grant it for this period, he could not say.

NOTTINGHAM GAS SUPPLY.

Committee's Report Adopted.

At the Meeting of the Nottingham City Council on Monday of last week, the report of the Gas Committee, which was noticed in last week's "JOURNAL," p. 54, came up for consideration. In moving the adoption of the report, the Chairman of the Committee (Alderman Ford) remarked that he did so with great pleasure, especially after the severe criticism which had been passed on the Committee. He ventured to think they would agree with him that the report was a very satisfactory one. He particularly wished to draw attention to the amount under the head of rates and taxes. This was the large sum of £15,455, or £2572 more than last year. But in spite of all the extra expenditure, the gross profits were £89,141, against £75,907 last year, or an increase of £13,234. Since the gas undertaking had been transferred to the Corporation in 1874, up to March 31 last, there had been paid to the Finance Committee the sum of £497,351. There had also been paid to the annuity redemption fund £4970, the sinking fund (consolidated stock) £60,078, loans and debentures £8125, the Giltbrook depreciation fund £5759, gas-stoves depreciation £8000, the repurchase of gas annuities £25,236, re-purchase of debentures £840, repaying loans £4100. During the year, £6100 had been paid to the Finance Committee, £4178 for re-purchase of gas annuities, and £4458 for re-purchase of debentures—making, with the reserve fund interest, a grand total of £629,199. This would prove that the purchase of the gas undertaking was a very wise step on the part of the Corporation. The reserve fund in 1874 was £23,652; whereas this year it amounted to £41,533. Mr. W. Elliott said he should like to ask why the gas had not been so good since the reduction in price. Alderman Radford congratulated the Gas Committee on the steps they had taken in regard to reorganization, which he believed would bring about very different results in the future. The new Gas Engineer (Mr. J. H. Brown) had succeeded in reaching a better level in regard to the number of cubic feet of gas produced per ton of coal. There was, however, still room for further advancement. The improvement had already resulted in a saving of 26 million cubic feet, which represented £3500 at sale price. At Nottingham, the total working expenses per 1000 cubic feet of gas sold were 17d.; while in the nine largest towns of the country, the average was only 13d. He looked forward to a further reduction in the price of gas, and thought the Committee would be well advised to still further increase the reserve fund. He had great pleasure in supporting the report. Mr. J. A. H. Green desired to know whether the experiment of requiring gas accounts to be paid on postal notice had met with success. Alderman Ford, replying to the last interrogation, said the experiment had met with great success. They had received a very large number of accounts at the outset. He added that he was not aware that the quality of the gas was different from what it used to be. The report was adopted.

"EUREKA"

GAS

COOKERS.

PUBLIC LIGHTING OF ISLINGTON.

Incandescent Gas v. Electricity.

At the last Meeting of the Islington Borough Council, the Lighting Committee brought up a report briefly recommending that no further steps should be taken for the extension of arc lighting in the Canonbury district at present. Mr. Polak moved, as an amendment to the motion for the adoption of the report, that the extension of the arc lighting as originally agreed to by the Council be carried out. Mr. Crole-Rees, in seconding the amendment, said the loan had been sanctioned, the columns purchased, and the contract for the laying of the cables sealed. Having done all this, it seemed to him too late to drop the scheme. The Town Clerk (Mr. Dewey), replying to a question, said the annual cost for lighting the district by incandescent gas would be for 47 single, 4 double, and 3 triple lamps, £185 6s. 3d.; while 27 arc lamps, at £49 (the figure fixed by the Borough Treasurer), would be £1323 a year. Mr. Cufflin said it was not proposed to abandon the arc lighting idea altogether, but to defer any extensions until the fullest investigation had been made. The Electric Lighting Committee charged 3¾d. per unit for public lighting; and the Borough Treasurer stated that on this there was a loss of 1½d. per unit supplied, or a total yearly loss of £6015. To decide, in the present state of things, to light Canonbury at an infinitely greater cost than they could get incandescent gas for, was a serious matter. Amid applause, Mr. Lemon said that, when the whole of the facts were before the Council and the ratepayers, it would become a question whether they should not abandon electricity altogether for public lighting, and adopt incandescent gas for the whole of the borough. The Council could not go on for ever giving a huge and increasing subsidy to electric public lighting. The amendment was negatived, and the Committee's recommendation adopted.

FREE PUBLIC LIGHTING AT FENTON.

In moving the adoption of the minutes of the Gas Committee at the last meeting of the Fenton Urban District Council, the Chairman said that the past year's working had resulted in a profit of something like £1358, which was divided up by handing over to capital account £1000, to reserve fund £200, and retaining £158 to pay for the re-arrangement and re-lighting of the Town Hall and Magistrate's Room. They had decided in the coming year to give a trial to supplying the whole of the gas for public lighting free, and to reduce the price of gas to consumers by 1d. per 1000 cubic feet. They had had a record production of gas—over 84 million cubic feet, or an increase of 5·9 per cent. for the year—while there had been a decrease of 1·9 per cent. in the unaccounted-for gas. He thought the results reflected the greatest credit upon the Manager (Mr. R. Surtees) and everyone connected with the works; for they had been obtained entirely by good management and new methods and improved procedure. For instance, let them take the leakage. It had been a year in which they might have expected leakage to be excessively high; and yet they found it had been 1·9 per cent. less. Then, again, there had been something like 4 million feet more gas produced for £68 less in labour than was spent last year. He dared say there would be some difference of opinion as to the method by which they should divide the profit; but personally he thought the best thing they could do would be to put £200 to the reserve fund, until the fund reached £1000, and allocate the remainder towards paying for the new purifiers. It was the paramount duty of the Council to see that the assets were of more value than the capital invested. Until recently this was anything but the case; and he greatly questioned whether it was so now. Things had materially improved; but at the same time they were reducing the liability on the works at nothing like the rate they ought to. Replying to a question by Mr. Fox as to whether a further reduction in the price of gas was not possible, the Chairman said they must not forget that they were giving the town free gas for the whole of the public lighting, which was equal to a reduction of over 4d. per 1000 feet. Mr. Fox: You mean the gas consumers are paying for the public lighting. The Chairman: No. Five-sixths of it goes back into the consumers' pockets. Mr. Goddard said he very much questioned whether it was fair to the gas consumers, as consumers, to be taking the large amount which was being taken at the present time from the gas-works entirely out of their pockets. He thought it was legitimate to provide a large part of the public lighting; but he objected to the whole of it being furnished at a time when they were taking such a large amount to build up their capital account at the works. The gas consumers and the ratepayers were not absolutely identical. He knew one large works in the town which used very little, if any, gas from Fenton. By the Committee providing the gas for public lighting free, this concern had benefited to an extent equal to a reduction of 4d. in its rates, and yet had not contributed anything to the profits. The Chairman remarked that he was indifferent as to whether the public lighting was supplied free or not; but he did contend that they ought not to think of going back to the condition of things that obtained three or four years ago. Then they were selling gas for less than it had cost to produce. They were carried away by the idea that large consumers ought to have very great consideration; and the consideration extended towards them was so great that the working people were actually paying 1½d. or 2d. per 1000 cubic feet of the gas which the large consumers used. With regard to the instance given by Mr. Goddard, it could be argued, on the other hand, that the manufacturers contributed one-eighth of the income of the Council and got absolutely nothing for it; and they were entitled to one-eighth of the profit of the gas-works. The minutes were confirmed.

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ELECTRIC LIGHTING NOTES.

Unsatisfactory Installation at Redditch.

Interest in matters connected with the electric light undertaking at Redditch will be increased by the publication of the experts' report on the present condition and prospects of the concern. We learn from a local source that, roughly speaking, £20,000 has so far been expended upon the scheme. The original estimates provided for an expenditure of about half this amount, with the likelihood of a small profit from the commencement of working. The area originally estimated to be covered has, however, been considerably exceeded. Instead of making a profit, the scheme has, so far, entailed an annual loss of more than £1000, necessitating the addition of 1s. in the pound upon the general district rate. At a public meeting of ratepayers held in March, it was decided that an expert should be engaged to report upon the condition of the existing plant and machinery, and advise as to the future development of the undertaking. Messrs. Burstall and Monkhouse, of London, were engaged to make an inspection; and their report was read at a recent meeting of the District Council. The experts are of opinion that an error of judgment was made in installing a high-tension alternating current system. In their opinion, the continuous current system would have been better. The cost of changing the system from alternating to continuous would, they think, be now prohibitive.

More Money for Kingston.

Colonel W. R. Slacke, R.E., one of the Inspectors of the Local Government Board, held an inquiry at the Town Hall, Kingston, with respect to the application of the Corporation for sanction to borrow £7784 for the purposes of their electric light undertaking. The Town Clerk, after having given the usual statistics in regard to population and assessable value of the borough, said the Local Government Board had sanctioned three loans for electric lighting—viz., in October, 1899, £15,000; in March, 1901, £15,000; and on the same date, £2800—making a total of £32,800. The total expenditure had amounted to £40,584, including a small item of £317 for additional work, which was absolutely necessary. After certain savings, the net excess was £7781. The present application was merely in respect to the additional expenditure found necessary in connection with the series of loans he had referred to. It was a fact that the Corporation would, in due course, on the advice of Mr. Burstall, who had been consulted specifically on these matters, have to apply for certain capital expenditure, the amount of which it was impossible to state, for extension of the undertaking and for meeting certain requirements that had come up. Their application that day was for one branch; and he wished to make it clear that they might in the future apply for some more money. The Inspector observed that it was much better to have the works already commenced finished before starting any more. The Electrical Engineer (Mr. E. Edgcome) gave evidence in support of the application. He said the works started to supply light in October, 1893. The number of lamps connected during last year was 25,767 of 8-candle power, exclusive of street lighting; but now it was 26,438. The charge at present was 6d. per unit for the first two hours and 4d. afterwards for lighting; for power, 3d. per unit up to 5000 units, between 5000 and 10,000 2½d., and 2d. above 10,000. An alteration had recently been made, and would take effect next January, when the charge would be 7d. per unit, and then 3d. The number of consumers was 548. In respect to street lighting, the cost worked out at a fraction under 2d. a unit on the old plan of using the arc lamps (76 in number) all night. Now side lights had been fitted, and at 12.30 a.m. these were used instead of the arc lamps. For each lamp they received £20; and he anticipated that the side lights would bring the price per unit up to about 2½d. During the last three years, there had been a marked improvement on the undertaking. Further evidence of a technical character was given by Major Macaulay, and the inquiry terminated.

An Expensive Luxury at Hastings.

When the ratepayers of a town display such a lack of interest in its affairs as to be indifferent about the extent of the expenditure incurred by their representatives in the Corporation, it implies either the possession of great wealth or the absence of business capacity. One would not expect to find such a condition of things prevailing at Hastings; yet, according to a local paper, it does, to a very large extent. Especially is this the case in regard to the electric lighting undertaking. When the proposal to purchase this concern was before the ratepayers, it was opposed, by the paper above alluded to, on the ground that the terms were unfair to the buyers. This has turned out to be perfectly true. The electric lighting undertaking is unprofitable, and is likely to continue so for some time to come. It must be acknowledged that the loss on the working during the past year is somewhat less than that of the two preceding years; but it amounts to £1080—a considerable sum, particularly when all the circumstances are taken into consideration. Added to the losses previously incurred, it makes a total deficit of £4518. The capital charges (interest and sinking fund) last year came to £8754, against £7550 in the preceding year; and they amount to nearly 7 per cent. on the total capital expenditure, which has practically doubled since the works were taken over by the Corporation. When they became responsible for the lighting, they paid £25 a year for each of the lamps on the sea-front; now they charge the ratepayers £40 per lamp, compared with £30 at Eastbourne, £26 10s. at Bexhill, and £20 at Tunbridge Wells. It appears that the burgesses are paying £40 instead of £25 per lamp, in order that the Corporation may provide private electric lighting to customers at a price which they are willing to pay. The paper from which we are quoting remarks that if the Corporation could show that the result of this extraordinary arrangement was to make a profit for the ratepayer, and thus lessen the rates, it would be all very well; but seeing that only a loss is made year after year, it is difficult to understand how

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anything can be said in justification of the action of the authorities. We agree that the finance of the Corporation in the matter of their Electric Lighting Department is not sound, and their business methods are crooked. The whole question needs to be considered; and it is quite time someone arose in the Council to demand a thorough and complete investigation. The ratepayers are now paying about £6000 a year for the lighting of some 90 miles of streets by gas; while the lighting of 4 miles of streets by electricity is costing £4125 per annum! If current were supplied at a fair price, the cost of public lighting would be materially reduced; and the ratepayers have the right to insist that this shall be done.

SALES OF STOCKS AND SHARES.

On Monday last week, Mr. Alfred Richards sold by auction, at the Mart, Tokenhouse Yard, E.C., fresh issues of shares in the Harwich Gas Company and the Tendring Hundred Water Company, and some stock of the Sutton District Water Company. The gas shares were of £5 nominal value, ranking for a maximum dividend of 7 per cent. per annum—the last dividend having been at the rate of 6 per cent.—and they fetched £5 10s. each. The issue by the Directors of the Tendring Hundred Water Company consisted of 500 "A" shares of £10 each, ranking for a maximum dividend of 8 per cent.; the last having been at the rate of 4½ per cent. They were all sold at par. A few lots of ordinary stock of the Sutton District Water Company, ranking for a maximum dividend of 10 per cent. per annum, and carrying a dividend at this rate, free of income-tax (equivalent to £10 9s. 2d. per cent. per annum in view of the present rate of the tax), were sold at £250 per £100 of stock. In accordance with the announcement which appeared in the "JOURNAL" for the 23rd ult., Messrs. John M. Leeder and Son offered for sale, at the Hôtel Métropole, Swansea, last Tuesday, £35,000 of the ordinary stock (5 per cent.), and £5000 of 4 per cent. perpetual debenture stock, of the Swansea Gas Company; being part of the additional capital authorized by the Company's Act of 1898. The stock was put up in 400 lots, and was sold in the remarkably short space of 45 minutes. The highest price realized for the ordinary stock was £110 10s., and the lowest £110 5s.—an average of £110 5s. 4d.—per £100 of stock. The debenture stock fetched prices ranging between £104 15s. and £105 15s.—an average of £105 8s.—per cent. The total amount realized by the sale was: Ordinary stock, £38,593 10s.; debenture stock, £5270—total, £43,863 10s. At the Greyhound Hotel, Croydon, on Thursday, Messrs. Hooker and Webb offered for sale by public auction £2500 of 5 per cent. perpetual debenture stock, and £5000 of consolidated "C" ordinary stock, of the Croydon Gas Company. Some lots of the debenture stock were sold at £130 per £100; and all the consolidated stock found purchasers—three lots at £189, two at £188, three at £187, eight at £186, and one at £185 10s.

METROPOLITAN WATER BOARD.

A Meeting of the above-named Board was held on Friday, at the Offices of the Metropolitan Asylums Board—Mr. R. M. BEACHCROFT in the chair.

The first important matters dealt with were financial. The Finance Committee reported that they had received a letter from the Local Government Board stating that the costs, charges, and expenses incurred by them in connection with the passing of the Metropolis Water Act, 1902, amounted to £7200, which had to be repaid by the Water Board when established. On the recommendation of the Committee, an order was made for the payment of this sum to the Local Government Board. It was also agreed to make arrangements with the Bank of England for advances, not exceeding £50,000, to meet payments ordered by the Board. A copy of the revised regulations as to stock, as finally settled by the Local Government Board, had been received by the Finance Committee; and these regulations have now been laid before each House of Parliament.

The next matter came up on a report presented by the Special Arbitration Committee, dealing with the case of *Lamplough v. Kent Water-Works Company*, originally decided by Mr. Justice Joyce, later by the Court of Appeal,* and now in the House of Lords on appeal by the Company. The matter in dispute was one relating to the payment of back-dividends; and the Committee pointed out that the question was of the gravest importance in connection with fixing the price to be paid by the Board for the water undertakings—making a difference in the case of the Kent Company alone of (apparently) £700,000. At present it stood for decision in a so-called "friendly action;" but, in accordance with Counsel's opinion, they had instructed their Solicitors to make an arrangement with the plaintiff and his Solicitors, by which the Board would be associated with him. This they had done. Mr. Fletcher Moulton, K.C., would be briefed to conduct the case in the House of Lords on behalf of the Board. The report was received.

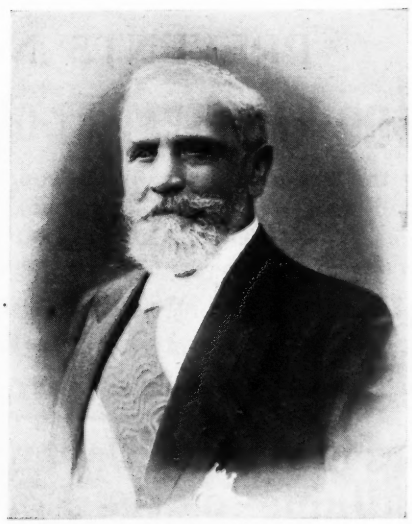
Resolutions were passed expressing the Board's appreciation of the assistance rendered by Mr. Aubrey V. Symonds as Acting Clerk during a period of more than three months, and asking him to accept an *honorarium* of £250; and thanking the Local Government Board for allowing one of their staff to undertake the duties of the position pending the appointment of a permanent officer. They added that Mr. Symonds had shown special capacity and knowledge in so marked a degree as to emphasize the obligation the Board were under to the Local Government Board for having made so happy a selection.

The Stettiner Chamotte-Fabrik Actien-Gesellschaft, of Stettin, have been the recipients of the highest award (a gold medal) at this year's Industrial Exhibition at Groningen, Holland.

* See "JOURNAL," Vol. LXXXI., pp. 486, 777.

"Household Words" "To-Day."

Richmond's Cooker.



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President Loubet.

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CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *July* 11.

Sulphate of Ammonia.

The market is quiet at all points, and there has been a slight decline in values, the closing quotations being £12 10s. per ton f.o.b. Hull, £12 13s. 9d. per ton f.o.b. Liverpool, and £12 15s. per ton f.o.b. Leith. The forward position being at a discount on spot prices, makers are showing anxiety to place their output immediately it becomes available, while buyers, for the same reason, are postponing their further purchasing as long as possible. For delivery ahead, no important first-hand business is reported, but considerable sales have been made by speculators, who are offering abroad at substantially below the equivalents of makers' prices.

Nitrate of Soda.

This is steady in all positions, notwithstanding the decision of the Committee of the Producers to increase the maximum quantity for shipment, April, 1903-March, 1904, to 32½ million quintals. The opinion is widely held that this maximum cannot be produced, and therefore cannot be shipped. It will, however, be some months before the point can be determined, and in the meantime a quiet market may be expected. To-day's spot prices are 9s. 4½d. to 9s. 7½d. per cwt., according to quality.

LONDON, *July* 11.

Tar Products.

Markets are generally quiet; and there is very little business doing. Pitch remains in the same position; but there is an absence of inquiry, which, however, is not unusual at this time of the year. In benzol, sales are reported of 90 per cent. at 8¼d. for export; and there is a decidedly improved demand for gas enrichment, which should harden the market for this article. In toluol, further business has been done at 6¾d. for early shipment; but this price was declined up to the end of the present year by London refiners. In crude carbolic, 1s. 6d. is still being freely paid for both prompt and forward; but crystals are very dull. Sales at very low prices are reported to have been made by German manufacturers for forward delivery. In anthracene, the position remains unchanged. There is really no business doing. There is a fairly good demand both for crude and refined naphthalene. Prices, however, remain stationary. In creosote, the market is certainly easier, especially in the North of England, where some large railway contracts have been taken at a reduced figure. There is nothing of importance to advise in tar. Prices in the provinces still remain in the same inflated condition.

The average values during the week were: Tar, 23s. 6d. to 33s. Pitch, London, 55s. 6d. to 56s.; east coast, 53s. to 53s. 6d.; west coast, 52s. to 52s. 6d. Benzol, 90 per cent., 8¼d. to 8½d.; 50-90 per cent. 7d. Toluol, 6¼d. to 6¾d. Crude naphtha, 2¾d. to 3d.; solvent naphtha, 7½d. to 8½d.; heavy naphtha, 9d. Creosote, London, 1¼d. to 1⅜d.; North, 1⅛d. to 1¼d. Heavy oils, 2d. to 2¼d. Carbolic acid, 60 per cent., 1s. 6d. Refined naphthalene, £5 to £8 10s.; salts, 21s. 6d. to 23s. 6d. Anthracene, "A" quality, 1⅜d. to 1⅝d.; "B" quality, 1d. nominal.

Sulphate of Ammonia.

The market is very quiet, and there is really no business to report; no transaction of any importance having taken place. The Gaslight and Coke Company quote £12 17s. 6d.; but they are unable to realize this, as business has been done on Beckton terms at £12 12s. 6d. At Hull, there are sellers at £12 10s. prompt; but buyers do not appear to take any interest in this market. In Leith, there are still sellers at £12 15s.; but no business of importance has taken place. Markets are decidedly quiet; but there is a general impression that there may be a slightly improved demand towards the end of the present month.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The loss sustained by the death of Mr. W. Foulis, of Glasgow, is still uppermost in the minds of his former colleagues and coadjutors. Following upon the funeral, a special meeting of the Gas Committee of the Glasgow Corporation was held, at which Mr. R. M. Mitchell, the Convener, made fitting reference to the loss they had incurred. He said that Mr. Foulis had the interests of the Gas Department very much at heart, and the Corporation and the city had lost a most faithful servant. For 34 years he devoted all his time to the work of the department; and his ability really amounted to genius. He was a straightforward, upright man, and they would experience some difficulty in filling his place. He moved that they insert in the minutes their deep sense of the loss they had sustained, and that an excerpt be sent to Mrs. Foulis. Mr. Willock, in seconding the motion, remarked that Mr. Foulis was a worthy man, in whom the interests of the department and of the city were deeply rooted. The motion was agreed to. The Committee then considered their position; and they eventually appointed a Committee to deal with the question of a successor to Mr. Foulis. They also decided that, in the meantime, the Managers of the various works should, as usual, look after their own establishments, and report to an Executive Committee of three, consisting of Mr. Mitchell, Mr. Willock, and Bailie Calderwood; and that Mr. Alexander Smith, the Assistant in the Engineer's Department, should supervise the construction of the new works at Provan.

On Monday of this week, a special meeting of the Town Council was held—Sir John Ure Primrose, the Lord Provost, in the chair—at which the minute of the Gas Committee just referred to was submitted. The Lord Provost said that, before asking the Council to approve of the minute, he might be permitted to allude to the loss they had sustained by the death of one of their most trusted officials. Mr. Foulis

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commanded the respect and the confidence of the entire House; and in all his actions for the Gas Department he proved himself a capable, trustworthy, and efficient officer. He was sure they all mourned his death, and would agree that they should record their sense of the loss they had sustained, and that an excerpt should be sent to the relatives of Mr. Foulis. Mr. Mitchell moved the adoption of the minute. He said he should like to supplement what the Lord Provost had stated with reference to the late Engineer. The Gas Committee had already expressed their sense of the loss the city had sustained by the death of Mr. Foulis; but he thought it was becoming that a similar expression should be given at the public meeting of the Corporation. Mr. Foulis had served them for more than a generation. It was seldom that service extended over so long a period, and still more rare that the service given year by year rose in its value, as had been the case with Mr. Foulis. He was at the head of his profession; and he knew it had been the delight of his colleagues to bestow upon him every honour it was in their power to confer. Since his death, he (Mr. Mitchell) had had private letters from many distinguished members of the Institution of Gas Engineers, containing tributes to the respect and admiration in which he was held in the profession that he adorned. Mr. Foulis was not only a good engineer in regard to the interests of the city, but he was also a man of sterling uprightness and honesty. He was sure they all mourned his loss. It would be difficult to fill his place; but if they passed the minute, which was perhaps the best conclusion at which the Gas Committee could arrive in the short time at their disposal, the great work Mr. Foulis had at heart—the completion of the gas-works at Provan—would be satisfactorily carried out, and the prosperity of the gas undertaking would be conserved by the efforts of the Committee and of those under them. The minute was unanimously approved. It was remitted to a Special Sub-Committee, consisting of Mr. R. M. Mitchell (Convener), Bailies D. M. Stevenson, Calderwood, and Stewart, and Messrs. M. W. Montgomery, A. Murray, W. Maclay, and J. Willock, to consider the whole position caused by the death of Mr. Foulis, and to make recommendations.

That the resignation by Mr. J. Kincaid of the post of Manager of the Falkirk Corporation gas undertaking came upon the Corporation as a surprise, is evident from the tone of a special meeting of the Town Council which was held on Thursday. Meeting in private first, the Council resolved to advance Mr. Kincaid's salary by £70, bringing it up to £300 a year—the intention being to make him as well off as he will be in Kirkcaldy. Mr. Kincaid declined the offer, holding that, having accepted the post at Kirkcaldy, he could not honourably draw back. On learning this decision, the Council resolved to accept the resignation, and to advertise for a Manager at the salary of £225, with free house, coal, and gas. The meeting having been made public, expression was given, by Provost Weir and others, to the regret which they all felt at Mr. Kincaid leaving them. There was entire unanimity among the speakers upon the excellent work which he had done in Falkirk, amid difficulties; and the hope was expressed that he would have remained among them, to see their new gas-works erected. Mr. Kincaid thanked the Council for their good opinions, and offered to render what assistance he could to his successor. When Mr. Kincaid went to Falkirk, the salary offered was not to exceed £230. If the addition of £70 now would have the effect of raising his salary to £300, it follows that he has received no advance since he went there. Considering the services he has rendered, it is strange that this should be so. The Council must be held to be blameworthy in the matter. Had they given him some recognition of his merits, the probability is he might have been not indisposed to put up with the inconvenience of serving a divided Council, and they might have had the benefit of his experience and advice in the erection of the new works. He may well ask why, if they were so much his friends as they now make out, they dissembled their love so long.

Mr. A. Gillespie, of Glasgow, has reported to the Corporation of Arbroath that the sum of £750 which has been annually set aside for the reduction of the debt upon the gas-works since they were taken over by the Corporation thirty-two years ago, is inadequate; and he recommends that an additional amount of £750 be annually set aside for the purpose—making £1500 in all—until the debt is wiped out.

A preliminary announcement with reference to the Hamilton Corporation Gas Department states that, as the result of an exceedingly favourable report by the Manager (Mr. J. Ballantyne), the Gas Committee are in the happy position of being able to recommend a reduction in the price of gas of 5d. per 1000 cubic feet, bringing it down to 2s. 1d., at which it was for several years prior to March, 1901.

The Town Council of Helensburgh, at a meeting last Saturday, had before them the financial statement for the past year of the Gas Department. There was, it was shown, a revenue of £10,411, and an expenditure of £9232, which left a surplus of £1179 on the year's working. In the course of four years, the capital account has been written down by £6000. In submitting the accounts and estimates, Mr. Mackay, the Convener of the Gas Committee, said that the statement amply justified a further reduction of 5d. being made in the price of gas. The sale of gas increased during the year by over a million cubic feet; and the unaccounted-for gas was reduced from 15 to 11 per cent. Mr. Mackay thought there should be a uniform charge for gas for all purposes; and he moved that the price be reduced from 4s. 2d. to 3s. 9d. per 1000 cubic feet. This was unanimously agreed to. Mr. Mackay was thanked for his efficient supervision of the department, and for the excellent results which had been achieved. This is all very gratifying; but it seems to me that the vote of thanks for excellent results should have been given to Mr. W. Blair, the Manager, and not to the Convener of the Committee.

The annual meeting of the Crieff Gaslight Company was held on Monday of last week. It was reported by the Directors that there had been a large increase in the consumption of gas, both for lighting and cooking purposes. The price was reduced from 4s. 2d. to 3s. 9d. per 1000 cubic feet. A dividend at the rate of 5 per cent., with a bonus of 1s. per share—equal to another 5 per cent.—was declared. At a special meeting of the shareholders, it was resolved to dissolve the

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WINDSOR ST. WORKS, BIRMINGHAM	2,000,000	KINGSTON, PA.	125,000	TONBRIDGE	300,000
SALTLEY WORKS, BIRMINGHAM	2,000,000	PETERBOROUGH, ONT.	250,000	STRETFORD	500,000
COLCHESTER	300,000	WILKESBARRE, PA.	750,000	OLDBURY	300,000
BIRKENHEAD	2,250,000	ST. CATHERINES (Second Contract)	250,000	TODMORDEN	500,000
SWINDON (New Swindon Gas Co.)	120,000	BUFFALO, N.Y.	2,000,000	SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000	WINNIPEG, MAN.	500,000	YORK (Second Contract)	750,000
WINDSOR ST., BIRMINGHAM (Second Contract)	2,000,000	COLCHESTER (Second Contract)	300,000	ROCHESTER (Second Contract)	500,000
HALIFAX	1,000,000	YORK	750,000	NEWPORT (MON.)	250,000
TORONTO	250,000	ROCHESTER	500,000	TOKIO, JAPAN	1,000,000
OTTAWA	250,000	KINGSTON, ONT.	300,000	PERNAMBUCO (Brazil)	125,000
LINDSAY (Remodelled)	25,000	CRYSTAL PALACE DISTRICT	2,000,000	MALTON	150,000
MONTREAL	500,000	DULUTH, MINN.	300,000	DULUTH, MINN. (Second Contract)	300,000
TORONTO (Second Contract Remodelled)	2,000,000	CATERHAM	150,000	BROCKVILLE (ONT.)	250,000
BELLEVILLE	250,000	LEICESTER	2,000,000	SMETHWICK	500,000
OTTAWA (Second Contract)	250,000	ENSCHEDE (HOLLAND)	150,000	GRAVESEND	300,000
BRANTFORD (Remodelled)	200,000	BUENOS AYRES (RIVER PLATE CO.)	700,000	NEWPORT MON. (Second Contract)	250,000
		BURNLEY	1,500,000	TORONTO (Third Contract)	750,000
		KINGSTON-ON-THAMES	1,750,000	TORONTO (Fourth Contract)	1,000,000

Complete Gas-Works at NELSON, BRITISH COLUMBIA.

LEEDS, 1,800,000 C. Ft. LEICESTER (2nd Cont.), 1,000,000 C. Ft. NEWCASTLE-ON-TYNE, 1,800,000 C. Ft.
MONTREAL, ONT. (Second Contract) . . . . . 1,800,000 Cub. Ft.

present Company, and to form a limited liability Company, with a capital of about £14,000.

The shareholders of the Brechin Gaslight Company held their annual meeting on Monday of last week. The Chairman—Mr. James Guthrie, J.P.—submitted the balance-sheet and the Manager's and Directors' reports, all of which, he said, were satisfactory. He congratulated the shareholders on having had a very successful and prosperous year, and complimented the Manager (Mr. Allan Reid) upon his excellent management in the conduct of the Company's business. The quantity of gas sold during the year was greater than in the previous twelve months by more than a million cubic feet. The main reason for the increasing consumption was the large demand for use in cooking-stoves and through prepayment meters. During the year, they had spent £930 upon new cooking and heating stoves, of which they had on hire considerably over 200. They have also now in use about 800 prepayment meters, which, they consider, more than make up for any loss they may have sustained on account of some consumers having adopted electric lighting. A new retort-bench on the latest principles had been erected, and was giving good results. The expenditure upon this and other works had been about £2210. The reports were adopted; and it was resolved to reduce the price of gas from 4s. 9d. to 4s. 6d. per 1000 cubic feet for lighting, and to 4s for cooking and heating. Several increases of salary were also granted, including one of £15 a year to the Manager.

At the annual meeting of the Galashiels Gaslight Company last Tuesday, Mr. J. Dickson, who presided, moved the adoption of the report of the Directors, a summary of which was given in these "Notes" last week. The report, he said, was of a most satisfactory character to the shareholders. Provost Riddle asked what was the difference in the quality of the gas manufactured at Galashiels, and sold at 3s. 4d. per 1000 cubic feet, and that produced at Hawick and sold at 2s. 11d. per 1000 cubic feet. The Chairman said he had no official information as to the quality of the gas manufactured at Hawick, but the standard in Galashiels had been maintained at an average of 28 candles. If incandescent gas lighting were more generally used in Galashiels, the Directors would be able to reduce the candle power of the gas and to sell it cheaper. The complaint had not generally been with regard to the price, but to the quality. Provost Riddle said that if the Company wanted people to go in more for incandescent lighting, they should reduce the standard and the price. Mr. R. Sanderson thought that the main objection to reducing the standard was that a good light was required in the mills. But if the millowners could be induced to go in for incandescent lighting, the standard might be reduced. The Chairman said the new Directors might be inclined to give this matter their consideration. The report was adopted. The Chairman made fitting reference to the retirement of Mr. Alex. Scott, the Manager, and to his long and faithful service to the Company. He moved that the shareholders show their appreciation of Mr. Scott's services by presenting to him a cheque for £100. This was unanimously agreed to.

The gross profit made by the Stirling Gas Company during the past financial year was £5672, to which there falls to be added £1294 carried forward; making together £6966. After payment of interest, income-tax, and the dividend on the 4 per cent. preference shares, there remains a balance of £5913. Out of this the Directors recommend that the standard dividend, amounting to £3200, should be paid on the original capital of the Company, and that the sum of £500 should be carried to the insurance fund, and the balance of £2213 carried forward. The price of gas has been reduced from 3s. 4d. to 3s. per 1000 cubic feet as from the 15th of May.

At the annual meeting of the Hawick Gas Company, on Friday, the 3rd inst., Mr. Thomas Laidlaw, who presided, moved the adoption of the report of the Directors, a summary of which was published in my "Notes" on the 30th ult. He said it was most gratifying to him to be able to say for another year that it was one of the most satisfactory reports he had ever placed before them—in fact, he considered it a record one, notwithstanding that they reduced the price of gas by 5d. per 1000 cubic feet a year ago. He was pleased to say that they were able to further reduce it this year by 2½d., notwithstanding that they had paid £1190 out of revenue for repairs to two gasholders. The consumption of gas was still on the increase; and last year they sold upwards of 6 million cubic feet of gas more than they did the preceding twelve months—a clear proof that the electric light which had been introduced into the street-lamps had not affected the gas consumption. He thought the shareholders might rely upon the wise judgment and guidance of the Directors, as well as of the Manager (Mr. Smith), who had been able to bring such an excellent report before them. The report was adopted, and a dividend of 10 per cent. was declared.

The annual report of the Directors of the Selkirk Gaslight Company stated that during the past year the gas manufactured was 30,311,451 cubic feet, as compared with 28,700,000 cubic feet the previous year, and that the quantity sold or otherwise accounted for was 28,305,451 cubic feet. There were 3025 tons of coal used; and the yield of gas per ton was 10,026 cubic feet. Plant for the manufacture of sulphate of ammonia was in operation during the year; and the result more than justified the expectation of the Directors. They have made contracts for the supply of coal for the current year at a slightly reduced price; and in view of this and other circumstances, including an increased revenue from residual products, they recommended that the price of gas be reduced from 3s. 1½d. to 2s. 11d. per 1000 cubic feet. The profits for the year amounted to £1165; and the dividend recommended was 10 per cent.—requiring £453. The report was adopted by the shareholders at the annual meeting of the Company last Friday.

The annual meeting of the partners of the Jedburgh Gas Company was held on Wednesday last. The profit and loss account showed that the profit on the year's transactions was £368. It was agreed to pay a dividend at the rate of 6s. per £6 share; to write off £100 for depreciation; and to carry forward £22.

The annual meeting of the Leslie (Fife) Gaslight Company was held last Tuesday. A most satisfactory report upon the working in the past year was submitted. Though the price of gas had been reduced, the

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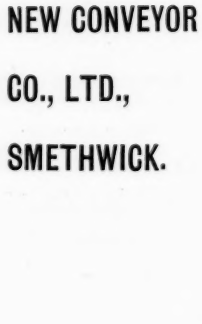

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profit amounted to £220, which admitted of a dividend at the rate of 7½ per cent. being paid, and £100 being placed to the reserve fund, which now amounts to £154.

The Dalry (Ayrshire) Gas Company have paid a dividend at the rate of 7½ per cent. for the past year. The Alyth Gaslight Company have paid a dividend at the rate of 3½ per cent., and have reduced the price of gas from 6s. 3d. to 5s. 10d. per 1000 cubic feet. The Melrose Gas Company have reduced the price of gas from 5s. to 4s. 7d. per 1000 cubic feet. The Earlston (Berwickshire) Gas Company have paid a dividend of 4s. per share. The Duns (Berwickshire) Gaslight Company have paid a dividend of 8s. on each of the accumulated shares of £6 5s. The Laurencekirk Gaslight Company have paid a dividend at the rate of 5 per cent. The Kirriemuir Gaslight Company have paid the same dividend as last year, and have continued the price of gas at 5s. per 1000 cubic feet; but, with the discount allowed, the actual price is 4s 9d. At the annual meeting of the Lochgelly Gas Company last Thursday, the Directors reported that the consumption of gas during the past year was 5 million cubic feet—an increase of a million feet upon the preceding year. A dividend at the rate of 7½ per cent. was declared. The Bo'ness Gas Company have had a very prosperous year, and have resolved to reduce the price of gas from 3s. 9d. to 3s. 4d. per 1000 cubic feet.

The preliminary report of Mr. W. R. Herring, of Edinburgh, to the Corporation of Broughty Ferry, as to the condition of the gas-works, has been forwarded to them, and they have circulated it. It deals mainly with the settings of retorts; and in the course of it he says there is no doubt settings Nos. 1 and 2 will require to be completely renewed this season. Mr. Herring also refers to the coals used, which, at their best, he says, will not yield more than 8500 cubic feet of 14-candle gas per ton. The coal is a very fair coking coal, but contains a large percentage of ash. Unless a handsome price is received for the coke—say, not less than 10s. to 12s. a ton—he says the Council cannot afford to use the coal. Mr. Herring visited the works on Wednesday, by which time portions of the front of the retort-bench had been, at his request, removed. He arrived early in the day, and spent from noon till after five o'clock in the works with the Emergency Committee. Thereafter a special meeting of the Town Council was held, at which he was present to explain any points the councillors might desire cleared up. The proceedings were private.

COAL TRADE REPORTS.

Lancashire Coal Trade.

Business in the coal trade of this district has for the time being settled down into the slackest trade of the year. At collieries there is a general restriction of the output to little more than half the usual average production—very few pits just now running more than about three days per week, especially those raising house-fire qualities. The demand upon the better sorts of round coal suitable for house-fire purposes is exceptionally small; and as lower prices would scarcely bring forward increased buying, collieries are curtailing their output as nearly as possible to what they can move away, except where it is considered advisable to put something into stock. Prices for the most part remain without actually quotable change, although "spot" lots are here and there to be picked up at special prices for prompt clearance; but even in these very little business is just now practicable. The quoted rates at the pit remain about 14s. and 14s. 6d. per ton for best Wigan Arley, 11s. and 11s. 6d. up to 12s. 6d. for seconds Arley and Pemberton four-feet, and from 9s. 6d. to 10s. 6d. for common house-fire coal. The lower descriptions of round coal also meet with only a very indifferent demand. Prices for common round coals, where sales can be made for prompt delivery, are weak, and in some cases cut considerably below the nominal list rates. Coalowners, however, are mostly disinclined to contract forward except at their basis prices. Common round coals are reported as obtainable in special lots as low as 7s. 6d. and 7s. 9d. up to 8s. per ton at the pit, with general quoted rates about 8s. 6d. to 8s. 9d. and 9s. for some special sorts. There are not many important gas-coal contracts now to be settled; and the bulk of the business has been put through on the basis of about 6d. under last year, although in odd cases collieries have not given way more than about 3d. per ton. There are reports, however, that considerable quantities of Yorkshire gas coals have been contracted for in the Birmingham district at 1s. to 1s. 6d. per ton below last year; the pit price being stated as about 7s. 6d. per ton. With regard to Lancashire gas coals, the average basis prices remain practically the same as have been stated recently, and may be given at about 9s. 3d. to 9s. 9d. per ton at the pit for ordinary screened Wigan Arley, with some of the best qualities fetching 9s. 9d. to 10s. The lower qualities of ordinary screened Wigan four-feet average about 8s. 3d. to 8s. 9d. per ton at the pit, and better sorts about 9s. Very low quotations continue to be made for shipping orders of common round coal, which is obtainable at from 8s. 9d. and 9s. per ton, in special clearance lots, up to 9s. 6d. and 9s. 9d. as the average quoted rates delivered at the ports on the Mersey. The short time working at the collieries and the restricted demand for screened coal are lessening the output of slack. Prices are not more than steady at about 3s. 9d. to 4s. 3d. up to 4s. 6d. per ton for some of the inferior sorts, and 4s. 9d. and 5s. up to 5s. 6d. for good medium qualities, with the best descriptions quoted 6s. 3d. and 6s. 9d. up to 7s. for some special sorts.

Northern Coal Trade.

There is a steady trade now being done in this district, more especially for export; and the range of prices may be said to be on the whole steady, though one or two classes of coal were affected by the recent labour difficulties at some foreign ports. In steam coals, best Northumbrians are about 10s. 7½d. per ton f.o.b. Second-class steams are about 9s. per ton f.o.b., and steam smalls 5s. 6d. There is no change of moment in the value of unscreened steam coals. In the gas

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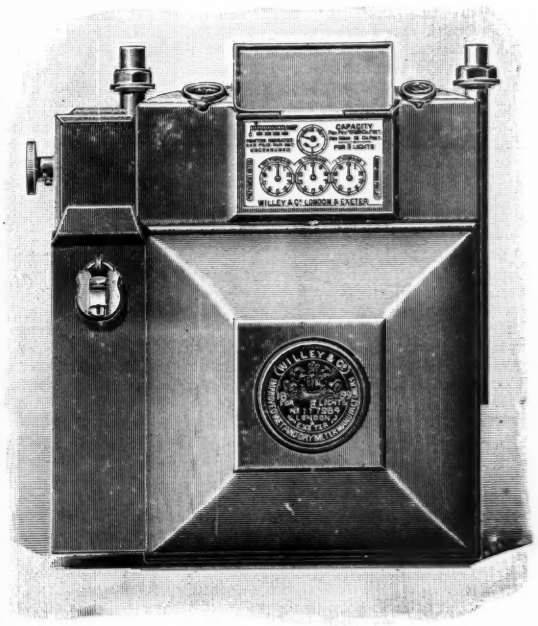

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coal trade, the demand is full for the season, particularly for export; and heavy shipments are being made both to the Baltic and Mediterranean ports. Durham gas coal, for occasional cargoes, varies in price from 8s. 6d. to 9s. per ton f.o.b., according to quality; but the deliveries on the large contracts are now not heavy. No additional contracts of importance are reported this week. Gas coke is in fair demand, so that the output is well taken up; the price being from 12s. 6d. to about 13s. 3d. per ton f.o.b. in the Tyne. At some of the inland centres of production, gas coke is less regular in quoted prices.

Scotch Coal Trade.

The market is quiet; the demand not being equal to the supply. This is, however, more owing to the miners working harder in order to make up for the recent reductions in wages than to a slackening in orders. As a matter of fact, there is a large turn-out of coal, and a bigger demand than usual, both for home and foreign consumption. But the supply overtopping the demand, prices have a tendency to go back. The quotations are: Main 7s. 9d. to 8s. per ton f.o.b. Glasgow, ell 8s. 3d. to 9s. 9d., and splint 9s. 3d. The shipments for the week amounted to 245,805 tons—an increase of 31,001 tons upon the previous week, and of 27,511 tons upon the corresponding week of last year. For the year to date, the total shipments have been 5,341,468 tons—an increase of 209,301 tons upon the same period of last year.

Gas and Electricity at Bangor.—On its being announced in the Bangor City Council that the profit on the gas-works last year amounted to £443, Alderman Lewis asked if it was not time to take steps to prevent this surplus being swallowed up by the loss on the electric light undertaking. He was told that the price charged per unit for current was too low, and might be safely and advantageously raised. The matter is to be taken into consideration by the Committee.

Incandescent Gas Lighting in London.—The Lighting Committee of the Hackney Borough Council stated in a report issued on Tuesday that they had, in connection with the carrying out of their general scheme for incandescent gas lighting, given an order for 50 new lamp-columns. Complaints from various parts of Chelsea as to bad lighting were received at the meeting of the Borough Council on Wednesday. In each case instructions were given to substitute incandescent lights for the ordinary gas-burners.

A Big Leakage of Gas at Carnarvon.—It was reported at the last meeting of the Carnarvon Town Council that the Gas Committee had engaged Mr. Henry Woodall to report on the abnormal leakage of gas which exists in the town. The figure rose to 15 per cent. last year; and Mr. Woodall attributes this mostly to the small size and extreme age of the mains. The Committee have therefore decided to lay aside £500 for the purpose of remedying the defect; and this they hope to accomplish without increasing the price of gas.

Gas and Water Profits at Lincoln.—The results of the past year's operations of the Lincoln Gas-Works are stated to be the best obtained in the history of the concern; a net profit of £2595 having been realized, owing in great part to the reduction in the price of coal. The Water Committee report a profit of £2184, out of which £1000 has been paid to the city fund, and £691 in the extension of mains—leaving £493 to add to the balance of £5618 standing to the credit of the profit and loss account, and bringing the item up to £6161.

New Gasholder for Copenhagen.—In response to the invitation by the Lighting Department of the Corporation of Copenhagen which appeared in the "JOURNAL" for the 17th of February, seventeen tenders were sent in for the construction of a three-lift gasholder of 3 million cubic feet capacity, the outer lift being 205 feet in diameter and 33 feet deep, for their southern gas-works. Eleven of the tenders were from German firms, five from the principal English firms, and the other from a Scotch firm. The 7th of April was the date originally fixed for the receipt of the tenders; but it was extended by about three weeks, in order to give American firms a chance of tendering. Of this, however, they did not avail themselves. The contract has been placed with Messrs. Clayton, Son, and Co., Limited, of Hunslet, Leeds.

Gosport Water Supply.—The work which has been going on at the Foxbury Well of the Gosport Water Company, with the object of securing a better supply of water for the town, has been stopped, apparently owing to failure to find a sufficient quantity of pure water to replace the saline mixture hitherto obtained. Some weeks ago the heading at the well from which the salt water came was obstructed, and the Company have been trying to get pure water from the other side of the well, to make up for the 500,000 gallons a day thus discarded. A month ago, it was reported that the efforts had not met with success, either as to quantity or quality, though one boring had been driven 400 feet. Since then it has been persevered with, but water has only dribbled through, and there were signs that any supply tapped would be brackish.

Pipes for Conveying Mond Gas.—We learn from the "Birmingham Post" that Mr. Mephan Fergusson, of Australia, has secured from the South Staffordshire Mond Gas Company an order for mains of sufficient magnitude to warrant him laying down a plant at Tipton for their manufacture. For this purpose, 10 acres of land have been purchased from the Tipton Land Company, and the work of levelling the ground is in active operation. Mr. Fergusson is the inventor of a peculiar type of pipe, which has been extensively used in Australia, notably at the Coolgardie Goldfields, where he supplied water-mains over a distance of 300 miles. The pipes are constructed of steel plates bent into semicircular shape, having a kind of flange to which a steel locking-bar is attached by means of hydraulic pressure. Another feature of the pipes is that they can be made in much greater lengths than those of cast iron, necessitating fewer joints. A 36-inch pipe, such as will be principally required by the Mond Company, will be made 28 feet long; whereas ordinary cast-iron pipes of this diameter are usually restricted in length to about 9 feet. Mr. Fergusson has brought a plant and several skilled men from Australia. The present contract is for 13 miles of mains.

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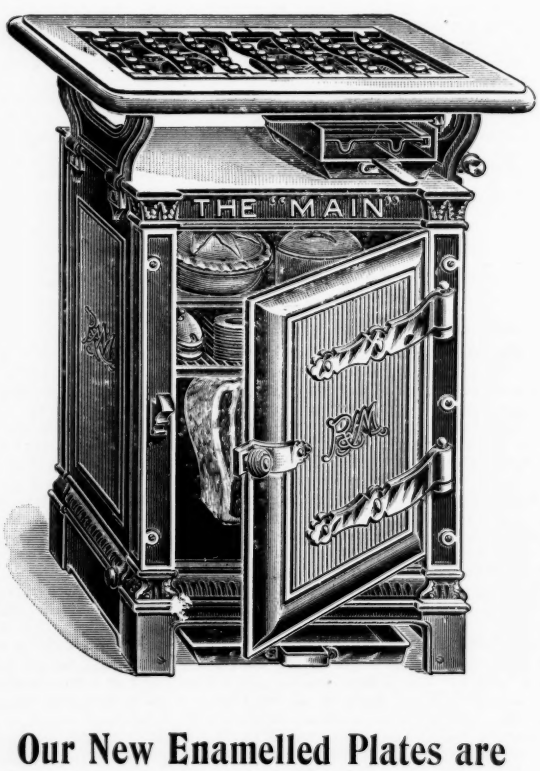

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Factories: LONDON AND FALKIRK.

Water-Gas Plant at Southport.—The Gas Committee of the Southport Corporation have resolved that a new section of carburetted water-gas plant and tar separator should be purchased; also that the present plant should be taken down and altered, so as to bring it into conformity with the latest type. The size of the two generators is to be increased. The total cost will be £4790.

The East London Water Company's Assessment Appeal.—The Town Clerk of Poplar, in his annual report, refers to the protracted proceedings in connection with the appeal of the East London Water-Works Company against their assessment. The result of the appeal was a reduction of only £73; while it cost the borough £2000 in law costs, which is regarded as a great hardship on them.

Suicide of a Gas Manager.—The unusual incident happened last Saturday of a gas manager committing suicide. The unfortunate man was James Duguid, of Oldmeldrum, Aberdeenshire. He made an attempt upon his life with a razor in the house, but was prevented by his daughter. Then he rushed out and completed the deed in the yard. He was 46 years of age, and leaves a family of four, the eldest of whom is 18 years.

Profit-Sharing at Stafford.—On the recommendation of the Stafford Gas and Electricity Committee, it has been resolved that 3½ per cent. (representing about £240) shall be paid to the clerks and workmen of both departments as their share of the profits of last year's working. The Chairman (Alderman Wright) said the scheme was passed by the Council some years ago, but owing to the rise in price of coal and the drop in coke it had been found impracticable to put it into force until now.

Explosion at the Aldershot Gas-Works.—A serious explosion took place in a new meter-house at the Aldershot Gas-Works in the very early hours of last Wednesday. The roof was lifted completely off, and considerable damage was done to the walls; but, thanks to the time at which the accident happened, no injury was caused to life or limb. As to the origin of the explosion, and the precise amount of damage done, the officials of the Company are unwilling to give any information, pending the full inquiry which is to be made.

New Gas-Works for Strabane.—An application by the Urban District Council of Strabane for a loan of £15,000 for the construction of new gas-works, formed the subject of an inquiry at Strabane last Thursday, by Mr. A. D. Price, M.Inst.C.E., on behalf of the Local Government Board (Ireland). Evidence showing the necessity for the proposed works was given by Mr. T. B. Feely, the Clerk to the Council, and Mr. Charles Hunt, M.Inst.C.E., their Consulting Engineer. It is proposed not only to construct entirely new works, but also to enlarge practically the whole of the distributing mains.

Gas Explosion at Tranent.—On the morning of Wednesday last, an explosion of gas occurred in the streets of Tranent, Haddingtonshire. For several days workmen had been looking for an escape of gas. On removing a metallic plate in the roadway near the Crown Hotel, one of the workmen applied a lighted match to an opening in the old town drain. Flame at once sprang out, and there was a loud noise, which was repeated about a dozen times as the flame sped down the drain in the High Street—flame belching forth at every opening. About 250 yards of footpath and roadway were damaged. A service-pipe near the Post Office was found to be fractured.

Nottingham Water Undertaking.—The statement of accounts prepared by the Nottingham Water Committee shows that the revenue during the financial year ending March 25 was £4594 more than in the preceding twelve months; but the expenditure was £7022 more. After paying the annuities, interest on loans and consolidated stock, and the annual contributions to the different sinking funds, the ultimate balance of profits amounts to £2003, which the Committee have carried forward to the account for depreciation, renewals, compensation to workmen under the Workmen's Compensation Act, and other purposes. On March 25, there were 68,542 houses furnished with water; and other supplies numbered 43,046—making a total of 111,588. The estimated population supplied was 308,439.

Public Lighting of Tunstall.—After a long discussion on the subject, the Tunstall Urban District Council have agreed to accept the tender of the British Gaslight Company to light the public lamps with gas on the following terms: £2 18s. 5d. per one-burner lamp and £4 8s. 6d. for three-burner lamps; the charge for gas supplied to the 100-candle power lanterns to be at the rate of 2s. 3½d. per 1000 cubic feet. Several of the members were of opinion that more favourable terms should have been secured; but the Clerk read a letter from the Company which stated that they were unable to reduce the charge, for the reason that, after paying the expense of lighting, extinguishing, cleaning, painting, and repairing, the present rate only left a net price of 1s. 11⅛d. per 1000 cubic feet of gas consumed.

High-Pressure Lighting.—During last winter an installation of the Keith light was made in the Foreign Fruit Market at Covent Garden. This has proved such a success, both with regard to the saving in gas and the increased illuminating power obtained over the old form of lighting, that the Duke of Bedford's agents have instructed the James Keith and Blackman Company, Limited, to make another complete installation equal to 21,000-candle power in the Flower Market. The same firm have also received from the Belfast Harbour Commissioners an order for two installations with duplicate compressing plant for the lighting of the Donegal Quay Goods Sheds. The total illuminating power of these two plants amounts to 40,000 candles. Before placing this extensive order, the Harbour Commissioners thoroughly satisfied themselves as to the efficiency of the Keith light by a protracted trial with a medium sized installation. Our contemporary the "Blackpool Times" states that the St. John's Market, Blackpool, is to be lit by the same system, instead of electricity. This is the result of experiments made on Wednesday evening in the Market, at which the members of the Committee were present. The electrical installation in the Market (which cost £180) is to be taken out; and the intensified incandescent gas system is to take its place. It is expected that £30 a year will be saved. This means 10 per cent. on the expenditure, which is an unusual return on ratepayers' money.

PARKINSON'S

EMBODIES MANY IMPORTANT IMPROVEMENTS

"CROWN" COOKER

PARKINSON AND
W. & B. COWAN, LTD.
(*Parkinson Branch*)
LONDON
AND
BIRMINGHAM.

Malvern Gas Profits.—It was reported at the last meeting of the Malvern Urban District Council that, after making ample provision for depreciation and the repayment of principal and interest, the profit on the gas-works for the past year amounted to £1650, or equal to a rate of 4d. in the pound.

Public Lighting of Oswestry.—An interesting discussion took place at the last meeting of the Oswestry Town Council, when a contract with the Gas Company for the lighting of the streets during the next seven years was agreed to. It was stated that all the lamps are to be fitted with incandescent burners, and that the contract contained a clause to the effect that, if the lamps on the outskirts of the town were persistently broken, the Company should be allowed to revert to the present system of lighting in those neighbourhoods. One member said he thought such a clause was ridiculous; but it was pointed out that the Company had suffered extensively from wilful breaking of the lamps, and that it was impossible to detect offenders, as the inhabitants would not give the necessary information. It had therefore been agreed that, if the lamps were persistently broken, and the offenders were undetected, the inhabitants should suffer by the power of the lights being reduced.

At the Health Exhibition held in connection with the congress of the Sanitary Institute at Bradford last week, the preliminary list of awards includes a silver medal to the Davis Gas-Stove Company, Limited, and bronze medals to the Anti-Vibration Incandescent Lighting Company and Messrs. Joseph Cliff and Sons.

As the Town Clerk of Lichfield (Mr. Herbert Russell) is the Solicitor to the Gas Company, of which he is also a member of the Board, it has been deemed advisable that an independent solicitor should be appointed to act for the Corporation in connection with their application for a supplemental Electric Lighting Order for an extended area; and at the last meeting of the City Council, Mr. George Ashmall was selected.

Messrs. Lewis Bros. and Steward, of 30, Westfield Terrace, Sheffield, have forwarded us a copy of the photographic group taken by them on the occasion of the recent visit of the Manchester District Institution of Gas Engineers to the Grimesthorpe Gas-Works. Those desirous o securing this memento of the pleasant time spent in Sheffield, should communicate with the firm. The price of the photograph (which is 12 in. by 10 in.) is 3s.

The Monifieth Gas Company have decided to adopt Waddell's patent regenerator furnaces.

A new pumping plant for the Penistone Urban District Council was started last week. It is arranged to supply 250 gallons a minute from a 13-inch borehole sunk to a depth of 400 feet. The cost of pumping is stated to be nine-tenths of a penny per 1000 gallons from the borehole to the reservoir. The Contractors for the work were Messrs. Chapman and Sons, of Salford; and the plant was supplied by the Worthington Pump Company. The contract for the whole of the work amounted to £1825.

Messrs. W. C. Holmes and Co. during the past week received orders for two 3 million feet patent "New" scrubber-washers for the Oldham Corporation, and for 250,000 cubic feet scrubber-washers of the same kind for the Dundalk and Holywood Gas Companies, to be used for ammonia extraction; also one of 3½ million cubic feet capacity to be erected at Amsterdam for cyanide extraction. The firm have likewise received orders for their improved "Western" Pelouze and Audouin tar-extractors, of 2½ and 3 million cubic feet per diem, from the Birmingham and Wigan Corporations.

Last Thursday night, the Stockton Fire Brigade had a call from Messrs. Ashmore, Benson, Pease, and Co.'s works, which now belong to the Power-Gas Corporation, Limited. The flames were first noticed to proceed from a quantity of hay adjoining a stable; and very soon a large open shed, of which the stable formed a part, while the other portion was used to store electrical accumulators and chemicals, was ablaze. The damage is placed by the works' officials at as high a figure as £5000. The shedding was worth but little; but it is stated that the stock of accumulators, which were of a specially large kind, was extremely valuable. The damage is fully covered by insurance.

We have received from the Leeds branch of Messrs. James Milne and Son, Limited, an excellently got-up brochure which contains a brief sketch of the history of the firm, and a description of the progress made by them in Leeds. It is ten years since this branch was opened; and already the business has so far outgrown the space at disposal as to render it necessary to secure a more extensive building. This has now been done, and a warehouse has been erected near the centre of the city, within a minute's walk of the five Railway Companies' stations. The pamphlet contains a number of photographs of the show-rooms and warehouse, from which some idea may be gathered of the large and varied stocks of gas and electric fittings, sanitary appliances, &c., which are held by the firm.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

AGENT (SCOTLAND) ENGINEERING FIRM. No 4062.
CARBONIZING FOREMAN. No. 4 57.
CARBONIZING FOREMAN. Wigan Gas Department.
GAS-FITTER. Chertsey Gas-Works.
GAS-FITTERS. Rotherham Gas Department.
MANAGER. Falkirk Gas Department. July 20.
STOKER. Biggleswade Gas-Works.
STOKER. No. 4064.
WATER METER INSPECTOR AND REPAIRER. Mid Kent Water Company, Snodland.
WORKING MANAGER. No. 4065.

Situations Wanted.

ACCOUNTANT OR SECRETARY. No. 4061.
REPRESENTATIVE OF ENGINEERING FIRM. No. 4063.

Plant, &c., for Sale.

PURIFIERS, &c. Bathgate Gas Company.

Plant (Second-Hand) Wanted.

LAMPS, COLUMNS, &c. Ringwood Gas-Works.

TENDERS FOR

Coal and Cannel.

ATHERTON GAS DEPARTMENT. Tenders by July 15.
DALTON-IN-FURNESS GAS DEPARTMENT. Tenders by July 15.
MILLOM GAS DEPARTMENT. Tenders by July 29.
RHONDDA GAS DEPARTMENT. Tenders by July 23.
SHIFNAL GAS COMPANY. Tenders by July 18.

Meters.

GLASGOW GAS DEPARTMENT. Tenders by Aug. 3.

Pipes and Pipe Laying.

RHONDDA GAS AND WATER DEPARTMENT. Tende by July 23.

Tank for Sulphuric Acid.

RHONDDA GAS DEPARTMENT. Tenders by July 23.

Sales of Stocks and Shares.

HIGH WYCOMBE GASLIGHT COMPANY. July 17.
WEST MIDDLESEX WATER COMPANY. July 21.
WOKING WATER AND GAS COMPANY. July 16.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name an address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under 3s.; each additional Line, 6d.

TERMS OF SUBSCRIPTION to the "JOURNAL."

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Abroad (in the Postal Union): £1 5s. 6d., payable in Advance.

All Communications, Remittances, &c., to be addressed to WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.
Telegrams: "GASKING, LONDON." Telephone: P.O. 1571a Central.

OXIDE OF IRON.

O'NEILL'S OXIDE has a larger annual sale than all other Oxides combined.

SPENT OXIDE purchased in any district.

GAS PURIFICATION & CHEMICAL CO., LD.,

JOHN WM. O'NEILL, Managing Director,

PALMERSTON HOUSE, LONDON, E.C.

WINKELMANN'S
"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for GAS-WORKS.
ANDREW STEPHENSON, 182, Palmerston House, Old Broad Street, London, E.C. "Volcanism, London."

BROTHERTON & CO., LIMITED.
Offices: Commercial Buildings, LEEDS.
Correspondence invited.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 45 & 47, Westminster Bridge Road, LONDON, S.E.
First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
Telegraphic Addresses:
"Braddock, Oldham." "Metrique, London."

DUTCH OXIDE OF IRON.

THE First Dutch Bog Ore Co., Ltd.
(Eerste Hollandsche Yzererts Maatv),
ROTTERDAM.
General Manager for England and Wales—
CHARLES E. FRY, LEAMINGTON; and at Tower Chambers, Brown Street, MANCHESTER.
London Managers—
E. PADFIELD & CO., 96-98, Leadenhall Street, LONDON, E.C.
General Manager (for Scotland)—
J. B, MACDERMOTT, 11, Bothwell St., GLASGOW.

COAL GAS TAR wanted.
Gas Managers in Gloucester, Somerset, Worcester, Devon, Wilts, Hereford, Monmouth, and Glamorgan PLEASE NOTE. BEST PRICE offered, either on Fixed or Sliding-Scale Basis.
State Quantity to offer for Prompt and Forward Delivery.
The SHARPNESS CHEMICAL COMPANY, Tar Distillers, Sharpness Docks, GLOS.

OXIDE OF IRON.
(NATURAL.)

BALE & CHURCH will be pleased to send Samples and Quotations, and make Offers for SPENT OXIDE.

BALE'S FIRE CEMENT, PAINT, AND GAS COAL.
5, CROOKED LANE, LONDON, E.C.

SULPHATE OF AMMONIA SATURATORS and LEAD WORK for Sulphate of Ammonia Plants.
For REPAIRS or ALTERATIONS, ring up "0848 BOLTON," or Telegraph "SATURATORS, BOLTON."
Largest Practice and most Up-to-Date Works in Britain.
JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS, BOLTON.

GAS TAR wanted.
BROTHERTON AND CO., LTD., Tar Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

IT is worth your while to buy direct. THE RELIANCE LUBRICATING OIL COMPANY 19 and 20, Water Lane, Great Tower Street, London, E.C., handle all kinds of Lubricating Oils, for Engines, Cylinders, Dynamos, Spindles, &c., Burning Oils, Solar Distillates, Carburetting Oils, and Spirits for Gas Making; Motor Oils, Fuel Oils, Animal, Fish, and Vegetable Oils, &c., for all purposes. Write for our "Trade Mark" Inkstand, sent free to customers. Non-customers, 2s. 6d. each. RELIANCE LUBRICATING OIL COMPANY, London, Glasgow, Newcastle-on-Tyne, &c. Established 1858. Telegraphic Address: "Subastral," London; A.B.C. Code used. Telephone No.: Avenue 5891.

SULPHURIC ACID for Sale.
BROTHERTON AND CO., LTD., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

PENNY-IN-THE-SLOT WORK.
H. GREENE & SONS, Ltd., are prepared to give QUOTATIONS to Gas Companies or Corporations for FITTING UP COMPLETE and CARRYING OUT the WORK in its entirety, either in Iron or Compo.
SURREY ENGINEERING WORKS, BLACKFRIARS ROAD, LONDON, S.E.
Telephone: 1693 HOP. Telegrams: "LUMINOSITY."

AMMONIACAL LIQUOR wanted.
BROTHERTON AND CO., LTD., Ammonia Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SPECIAL PAINT FOR GAS-WORKS.
JOHN E. WILLIAMS AND CO.,
VICTORIA PAINT WORKS, MANCHESTER.
Telegrams: "ENAMEL." National Telephone 1759.

PATENTS AND TRADE MARKS PUBLICATIONS. "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE of EQUIVALENTS, Mechanical and Chemical," 6d.; "SUBJECT-MATTER of PATENTS," 6d.
MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 and 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 243 Holborn.

HYDRATED OXIDE OF IRON.
PREPARED from Pure Iron.
Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market.
Can be Lent on Hire.
Can be Exchanged for Spent Oxide.
READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

BY the adoption of Cripps's Bye-Pass VALVES inside your Purifiers, you can relieve the Back-Pressure in the Lower Tiers when the Purifying Material gets hard. They are extremely useful and economical.
Sole Makers: C. & W. WALKER, LIMITED, Midland Iron-Works, Donnington, near Newport, SHROPSHIRE.

JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of Special SULPHURIC ACID, for Sulphate of Ammonia Making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol, which has now been used for upwards of 50 Years. References given to Gas Companies.

STREET AND SHOP LAMPS AND LANTERNS.
MARK DUFFIELD & SONS (Established 200 Years), Makers of Street and Shop Lamps to own Pattern and Design. Any description of Lamp made. Inquiries invited.
London Manager: EDWARD PADFIELD, West India House, 96 & 98, LEADENHALL STREET, E.C.
Telegraphic Address: "EUPATHY, LONDON."

AMMONIACAL Liquor wanted by JOHN RILEY & SONS, Hapton, near ACCRINGTON.

THE Pipe Union Clip Company, HOLMES CHAPEL, near CREWE, Sole Manufacturers of the PATENT UNION CLIP, which ensures that all Gas used passes through the Meter. Many Companies already use them with quite astonishing results.
Prices and other Particulars on application.

GENTLEMAN, Seven Years' Experience in the Gas World, wishes to REPRESENT a Firm of Manufacturers.
Address No. 4063, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

CHARTERED Accountant (Honours), having considerable Experience in Gas and Water Companies' Accounts, including Arbitrations, desires LONDON SECRETARYSHIP or AGENCY. Will advise or assist others.
Address No. 4061, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a good Gas-Fitter.
Apply, by letter, to the MANAGER, Gas-Works, CHERTSEY.

COUNTY BOROUGH OF ROTHERHAM.
(GAS DEPARTMENT.)
WANTED, Gas-Fitters. None but First-class Men need apply.

WANTED, at once, a steady and reliable STOKER, willing to do odd jobs when required. Regular work to a suitable Man. Minimum Wage 21s. per week.
Apply to S. SHADBOLT, Gas-Works, Biggleswade, BEDS.

WANTED, a good Stoker, used to Shovel Charging. Wages 32s. per week. None but steady and Reliable Men need apply.
Apply, by letter, stating Age, Experience, and Reference, to No. 4064, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WATER-METER Inspector and Repairer Wanted. Thoroughly competent Man. Must Cycle.
Apply, with Particulars of Experience, *copies* of References, and Wages required, to the MID-KENT WATER COMPANY, Snodland, KENT.

WANTED, an Agent in Edinburgh or Glasgow to REPRESENT a well-known English Constructional Engineering Firm for Scotland. Only those who are in touch with the requirements of Gas-Works, and are well-known in the respective districts, need apply.
Apply, by letter, to No. 4062, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS Manager wanted by the Falkirk Town Council. Present Manufacture 142 Million Cubic feet.
Salary, £225. Free House, Coal, and Gas.
Applications, with *copies* of Testimonials, marked "Application for Gas Managership," to be lodged with the subscriber not later than noon on the 20th of July.
A. BALFOUR GRAY,
Town Clerk.
Falkirk.

COUNTY BOROUGH OF WIGAN.
THE Services of a Carbonizing Foreman are required by the Gas Committee of the above. Particulars may be obtained on writing to the undersigned.
State Age and Experience. References (not Testimonials) to accompany the application.
Jos. TIMMINS, M.Inst.C.E.,
Engineer, &c.
Wigan, July 10, 1903.

WANTED, a Working Manager for a Country Gas-Works (about 4 Million Cubic Feet per annum). Applicant to State Wages required.
The Company provide House, Garden, Gas, and Coal free.
A thoroughly practical all round Man is required. Experienced Fitter, and able to do anything from Stoking to the Reading of Meter Indices.
Apply, by letter, to No. 4065, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

CARBONIZING FOREMAN.
WANTED, immediately, a thoroughly practical Man as CARBONIZING and YARD FOREMAN for a Works manufacturing 400 million cubic feet per annum. Must understand Inclined Retort Settings and Regenerative Furnaces and the general routine of a Gas-Works Plant. House, Coal, and Gas provided.
Apply, by letter, stating lowest Wages required, to No. 4057, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, 25 Second-Hand Lamp- COLUMNS, CRADLES, and LAMPS.
State Price and full Particulars to G. W. THOMAS, Manager, Gas-Works, Ringwood, HANTS.

WANTED, Gas Carbon, in Four Ton Lots or more, f.o.r. Must be Clean and Hard Lumps.
Address No. 4044, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TO BE SOLD—Purifiers, Two or Four, 10 feet square by 4 ft. 6 in. deep, planed Joints, Connections, and Overhead Girders.
Write J. WRIGHT, 181, QUEEN VICTORIA STREET, E.C.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

FOR SALE—Two Purifiers, 10 ft. by 8 ft. by 4 ft. deep, with 9-inch Four-Way Valves and Connections; also Lifting Apparatus. All in First-Class Order.
Apply BATHGATE GAS COMPANY, LTD., BATHGATE, N.B.

TAR Contracts Wanted on the Sliding-Scale or at Fixed Prices
Managers and Secretaries desirous of selling to best advantage please communicate with DENT AND CO., Ouse Chemical Works, SELBY.

GLASGOW CORPORATION.
(GAS DEPARTMENT.)

THE Corporation invite Tenders for the supply of such METERS as may be required by them for Twelve Months from date of acceptance.
Forms of Tender may be obtained on application at the Gas Manager's Office, 45, John Street, Glasgow; and sealed Offers, marked "Tender for Gas-Meters," and addressed to the Subscriber, will be received by him on or before Monday, the 3rd of August.
The Corporation do not bind themselves to accept the lowest or any Offer.
J. D. MARWICK,
Town Clerk.
City Chambers, Glasgow,
July 11, 1903.

MILLOM URBAN DISTRICT COUNCIL.

TENDERS are invited for the supply of 1200 to 2500 Tons of GAS COAL, at such times and in such quantities as the Council may require, during Twelve Months from the 1st of August next.
The Coal must be of the best quality.
Full Particulars of the Coal, Colliery, and Working Analysis to be given.
State Price per Ton delivered free at Millom Station (Furness Railway).
Sealed Tenders, on Forms (which can be had on application), endorsed "Tender for Coal," to be sent in to me not later than the 29th of July inst.
The Council will not be bound to accept the lowest or any Tender.
W. T. LAWRENCE,
Clerk.
Millom, July 7, 1903.

SHIFNAL GASLIGHT AND COKE COMPANY.

TENDERS FOR GAS COAL.

THE Managing Partners of the above Company are prepared to receive TENDERS for the supply of 1000 Tons, or less, of a good quality of GAS COAL or large NUTS, including carriage to Great Western Railway Station, Shifnal, Salop, for a Period of Twelve Months from or about the end of August next.
Tenders to be accompanied by Practical Working Analysis.
The Coal and Nuts to be free from Sulphur, Bats, Refuse, and Dirt, and to be weighed upon the Company's Machine.
The Supply to be in such quantities weekly as may be ordered by the Clerks to the Company.
Payments will be made from time to time, so long as the Contractor shall duly fulfil his contract.
The Managing Partners do not pledge themselves to accept the lowest or any Tender.
Sealed Tenders, endorsed "Tender for Gas Coal," must be delivered at our Offices, Victoria Road, Shifnal, Salop, not later than Saturday, the 18th of July inst.
By order,
FARMER AND FARMER,
Joint Clerks to the said Company.
July 1, 1903.

RHONDDA URBAN DISTRICT COUNCIL.
(GAS AND WATER DEPARTMENT.)

THIS Council are prepared to receive TENDERS for the following:—
1.—The Supply of 15,000 Tons of GAS COALS, to be delivered from the 1st of August, 1903, to the 30th of June, 1904, at Porth and Ystrad Gas-Works.
2.—CAST-IRON PIPES required during the Year ending the 30th of June, 1904.
3.—SULPHURIC ACID STORE TANK.
4.—LAYING and JOINTING of about 2500 Yards of 6, 4, 3, and 2 inch Water-Mains at Blaencwm, Treherbert, and Clydach Vale.
Plans and Specifications can be seen, and Forms of Tender obtained, on application to the Engineer and Manager, Mr. Octavius Thomas, Gas and Water Offices, Pentre, R.S.O., Glam.
Contractors will be required to pay the standard rate of wages recognized in the district.
Tenders to be addressed to the Chairman of the Gas and Water Committee, endorsed Tender for "Coals," "Pipes," "Acid Tank," or "Laying Water-Mains," as the case may be, and delivered at my office on or before ten a.m. on Thursday, the 23rd of July, 1903.
The Council do not bind themselves to accept the lowest or any Tender.
WALTER P. NICHOLAS,
Clerk.
Council Offices, Pentre, R.S.O.,
Glam., July 11, 1903.

WEST MIDDLESEX WATER-WORKS COMPANY.

NOTICE is Hereby Given, that the Directors are prepared to receive TENDERS for such amount of THREE PER CENT. INTERCOMMUNICATION DEBENTURE STOCK as will produce (after deducting expenses of issue) £20,500 in cash; being the amount sanctioned by the Local Government Board under the provisions of the Metropolis Water Act, 1899.
The Stock will be redeemable at par after the expiration of 25 Years from the date of issue, on Six Months' Notice being given by the Company.
The Stock is one in which Trustees are authorized to invest.
Tenders must be delivered at the Company's Office, No. 19, Marylebone Road, N.W., not later than Eleven a.m. on Tuesday, the 21st of July next.
Particulars and Conditions, together with Form of Tender, may be obtained at the said Office, or will be forwarded on application.
By order of the Board of Directors,
F. H. WYBROO,
Chief Clerk and Secretary.
No. 19, Marylebone Road, N.W.,
June 26, 1903.

THE Urban District Council of Atherton invite TENDERS for the supply of 6500 Tons of screened GAS COAL or NUTS, from the 1st of August, 1903, to the 31st of July, 1904.

Forms of Tender and further Information may be had from the undersigned, to whom Tenders should be delivered on or before Wednesday, July 15 inst.

DANIEL SCHOFIELD,
Clerk.

Town Hall, Atherton,
Lanes., July 6, 1903.

WOKING WATER AND GAS COMPANY.

SALE BY TENDER OF 1500 ORDINARY SHARES OF £10 EACH, IN 1500 LOTS OF ONE SHARE EACH.

IN PURSUANCE OF THE WOKING WATER & GAS ACT, 1899.

NOTICE is Hereby Given, that it is the intention of the Directors of this Company to SELL BY TENDER 1500 ORDINARY SHARES OF £10 EACH, to be paid up in full on or before July 31 next, such Shares being a portion of the Additional Capital authorized to be raised by the said Act and sanctioned by a Resolution passed at an Extraordinary General Meeting of the Proprietors held on the 8th of June, 1903.

Particulars and Conditions and Form of Tender may be obtained on application at this Office.

The sealed Tenders must be sent in not later than Twelve o'clock noon on Thursday, the 16th day of July, 1903.

By order of the Directors,
B. DENNETT HOLROYD,
Secretary.

Office of the Company:
5 and 6, Great Winchester Street,
Old Broad Street, London, E.C.,
July 3, 1903.

The Circular from which this advertisement is abridged has been filed with the Registrar of Joint-Stock Companies, in accordance with the Companies Act, 1900.

THE HIGH WYCOMBE GASLIGHT AND COKE COMPANY, LIMITED.

SALE BY TENDER OF 800 PREFERENCE SHARES OF £5 EACH,

which will be entitled to a fixed Preferential Dividend of £5 per centum per annum, to be paid out of the profits of each year, and to rank, both as regards Capital and Dividend, in priority to the Ordinary Shares of the Company, and *pari passu* with the existing Preference Shares of the Company and any future issue of Preference Shares authorized to be raised under the powers of the High Wycombe Gas Order, 1901.

The Minimum Price of each Preference Share is £5; and the Minimum Subscription upon which the Directors will proceed to allotment is 600 Shares of £5 each.

A deposit of 10s. per Share must accompany each Tender, and the balance of the Purchase Money shall be paid on or before the 14th day of August next.

Applications must be lodged in sealed envelopes, marked "Tender for Preference Shares," at the Offices of the Company, Gas-Works, Newland, High Wycombe, or through their Bankers, the Capital and Counties Bank, Limited, at their Head Office, at their High Wycombe Branch, or any other of their Branches, not later than Four o'clock in the Afternoon, on Friday, the 17th day of July next.

The Shares will be allotted to the persons making the highest Tenders, subject to Clause 8 of the High Wycombe Gas Order, 1901.

The following are the Particulars of previous offers of Shares, and the amounts paid on such Shares; the whole amount offered having in each case been allotted:—

No of Shares offered and allotted.		Amounts paid thereon. £	s.	d.
1480	£5 Ordinary	7400	0	0
1480	£2 do	2960	0	0
289	£5 do	2198	15	0
200	£5 do.	1598	0	0
890	£5 do.	6475	0	0
1000	£5 do.	7817	0	0
800	£5 Preference	4000	0	0

No Shares of the Company have been issued or agreed to be issued otherwise than in Cash.

Loan Capital, consisting of £6100 £4 per cent. Mortgage Debentures, has been issued; and a further sum of £8150 is authorized, but unissued.

The net Premium Capital of the Company amounts to £6544 11s. 7d., which is available for use in the undertaking, but entitled neither to Interest nor Dividend. The Reserve Fund amounts to £1072 0s. 6d.

The Company's business has progressed from 8,202,700 cubic feet sold to 418 Consumers in 1872, to 44,421,200 cubic feet sold to 1824 Consumers last year. The selling price is 4s. 2d. per 1000 cubic feet, less discounts.

The Capital now to be raised is required for Extensions of Mains and General Working Purposes.

No material Contracts have been entered into by the Company within Two Years immediately preceding the publication of this Circular, save such as have been entered into in the ordinary course of the Company's business.

The Auditors of the Company are Messrs. Lass, Wood, and Drew, of 30, Gracechurch Street, London.

Full Particulars and printed Forms of Tender can be obtained of the Secretary to the Company, Gas-Works, Newland, High Wycombe, or of Messrs. Clarke and Son, Solicitors, High Wycombe.

June 18, 1903.

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Terms for Issuing such Capital, and also for including Gas and Water Stocks and Shares belonging to Private Owners in these Periodical Sales, can be obtained on application at MR. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

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See other List in "JOURNAL" for June 30.

THE FLOW OF GASES AND PROPORTIONING GAS-MAINS.—By F. SOUTHWELL CRIPPS, Assoc. M.Inst.C.E. *Price 7s. 6d.*

REPORTS OF DISTRICT ASSOCIATIONS OF GAS ENGINEERS AND MANAGERS FOR 1902. *Price 5s. 6d.*

GAS COMPANIES' BOOK-KEEPING.—By JOHN HENRY BREARLEY and BENJAMIN TAYLOR, of Longwood. *Cloth*, 12s. 6d.; *Morocco Gilt*, 18s.

AUTOMATIC METER REGISTER.—By ROBERT P. KEYS. *In sizes to record 100 Meters, with Index, half bound, 42s.; to record 500 Meters, 35s.; to record 250 Meters, 31s. 6d.*

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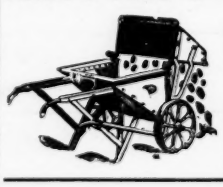

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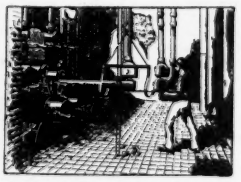

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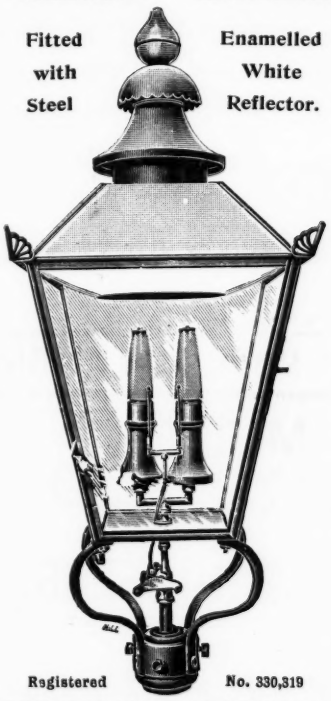

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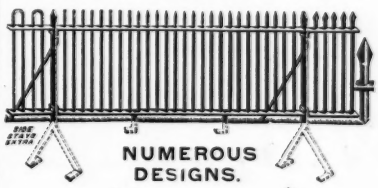

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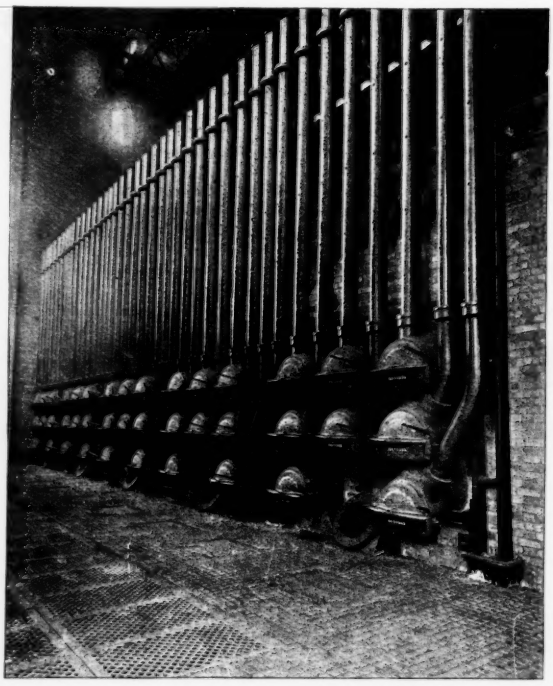

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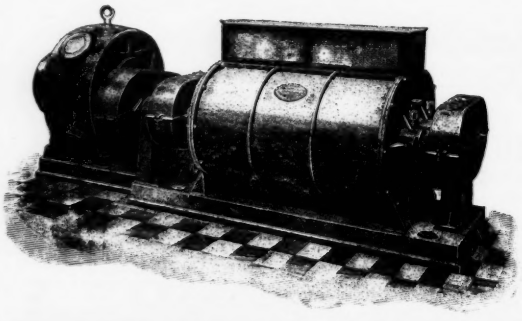

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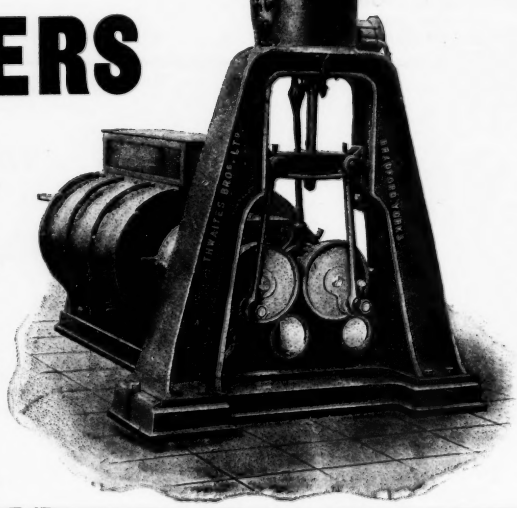

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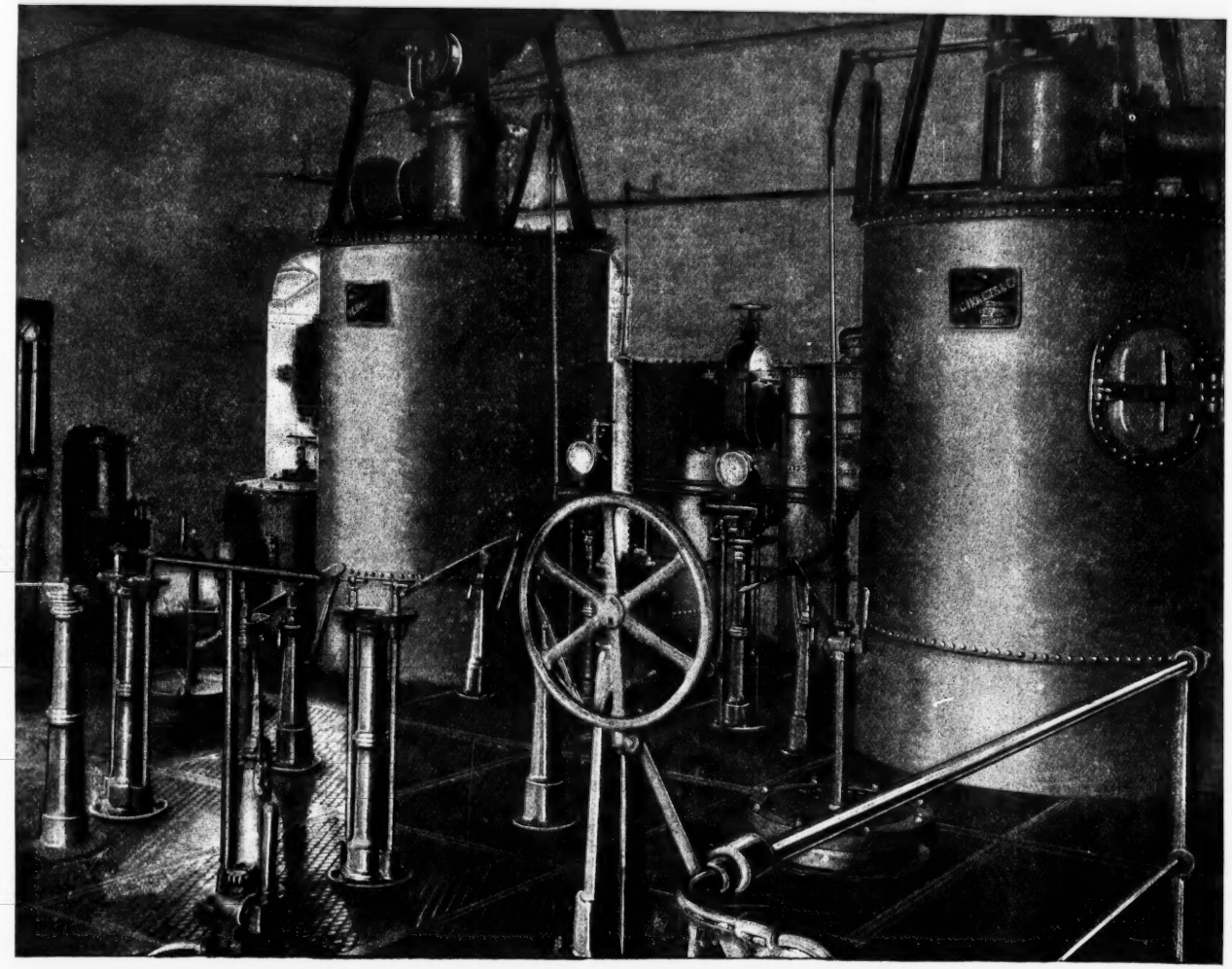

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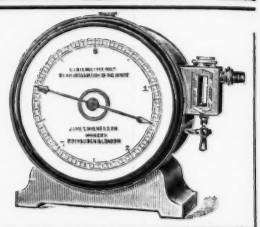

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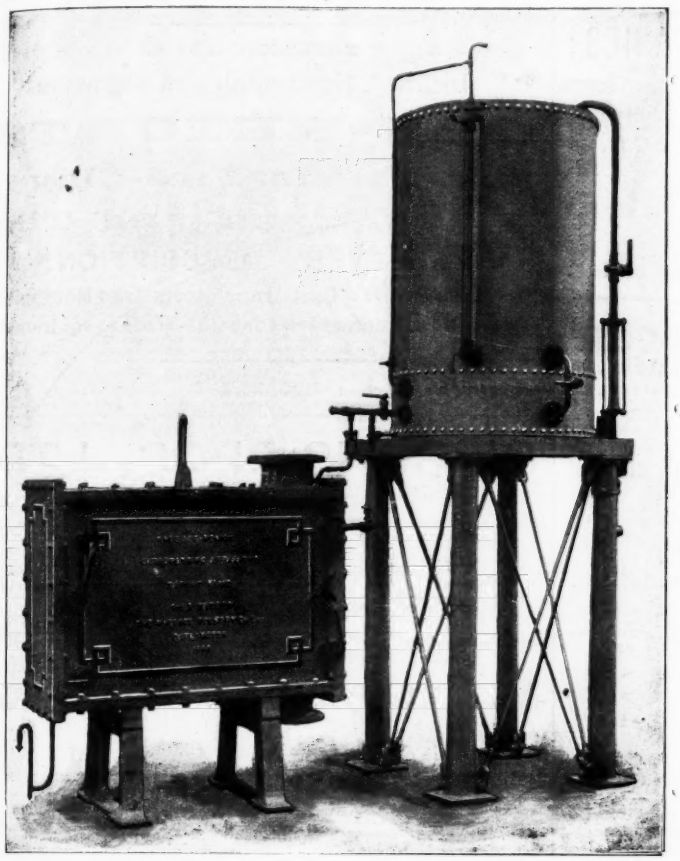

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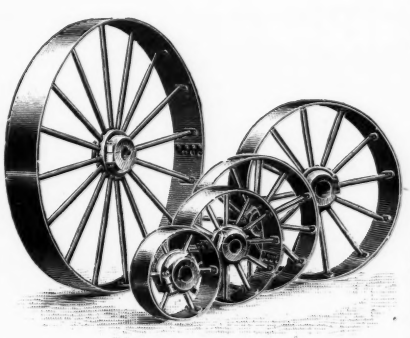

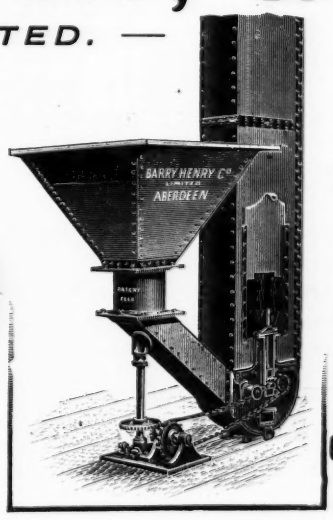

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A History of the Question of Price in London from the Introduction of Gas Lighting to the Present Time.

By LAURENCE W. S. ROSTRON, M.A., B.C.L.,

Of New College, Oxford, and Lincoln's Inn, Barrister-at-Law.

With a Preface by

GEORGE LIVESEY, M.Inst.C.E.

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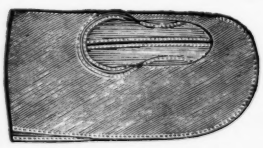

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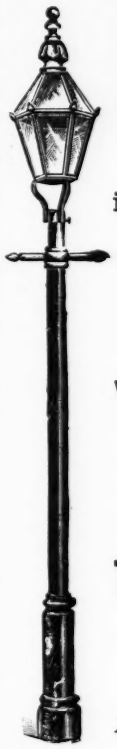

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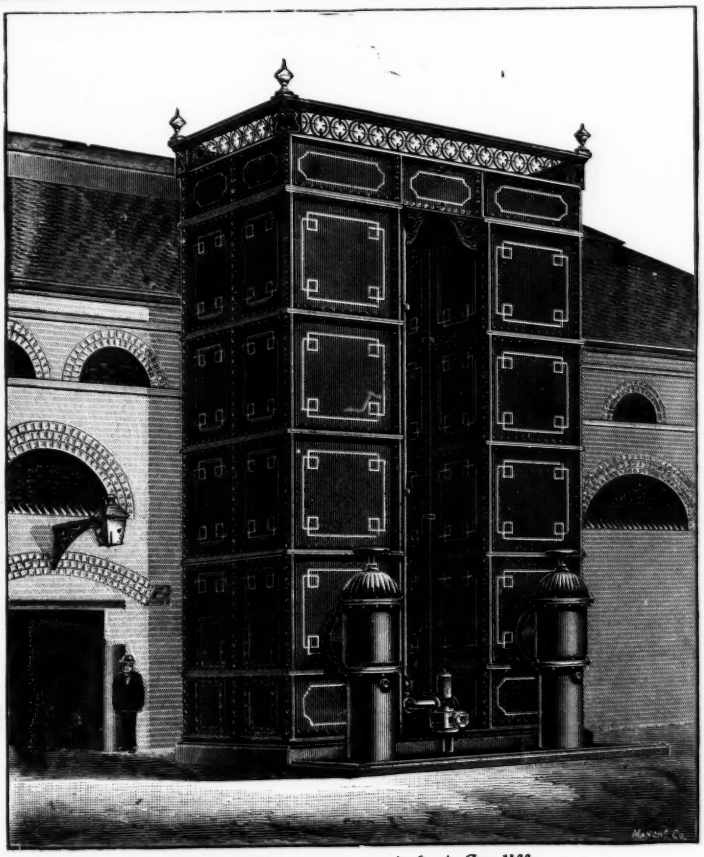

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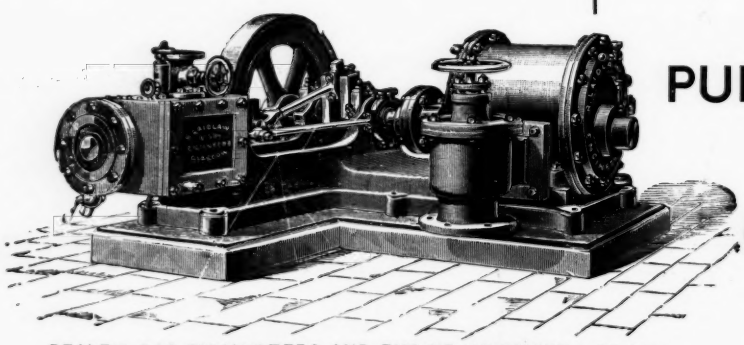

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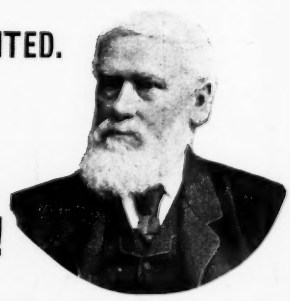

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